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UNITED STATES DEPARTMENT OF AGRICULTURE

AGRICULTURAL RESEARCH SERVICE

E X P L A N A T O R Y N O T E S

Fiscal Year

1979

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AGRICULTURAL RESEARCH SERVICE

Purpose Statement

The Agricultural Research Service (ARS) was established on November 2, 1953, pursuant to authority vested in the Secretary of Agriculture by 5 U.S.C. 301 and Reorganization Plan No. 2 of 1953, and other authorities.

The research performed by the Agricultural Research Service is authorized by the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511), the Research and Marketing Act of 1946, as amended (7 U.S.C. 427, 427i), and the National Agricultural Research, Extension, and Teaching Policy Act of 1977 (P.L. 95-113).

The Agency is responsible for conducting basic, applied, and developmental research of:

- Animal production
- Plant production
- Use and improvement of soil, water, and air
- Processing, storage, distribution, food safety, and consumer services
- Human nutrition research

The research applies to a wide range of goals; commodities; natural resources; fields of science; and geographic, climatic, and environmental conditions. It is categorized into 67 ARS National Research Programs and eight Special Research Programs.

The mission of ARS research is to develop new knowledge and technology which will insure an abundance of high quality agricultural commodities and products at reasonable prices to meet the increasing needs of an expanding economy and to provide for the continued improvement in the standard of living of all Americans. This mission focuses on the development of technical information and technical products which bear directly on the needs to (1) manage and use the Nation's soil, water, air, and climate resources and improve the Nation's environment; (2) provide an adequate supply of agricultural products by practices that will maintain a permanent and effective agriculture; (3) improve the nutrition and well-being of the American people; (4) improve living and rural America; (5) strengthen the Nation's balance of payments; and (6) promote world peace.

Under the authority of Section 104(b)(1) and (3) of Public Law 480, the Agricultural Trade Development and Assistance Act of 1954, as amended, ARS directs foreign research mutually beneficial to the United States and the host country which can be advantageously conducted in foreign countries.

The Agency's research is conducted at numerous field locations in the States, District of Columbia, Puerto Rico, the Virgin Islands, and in several foreign countries. Much of the work is conducted in direct cooperation with the State agricultural experiment stations, other State and Federal agencies, and private organizations.

Central offices for the Administrator of ARS and his staff, which are in the Washington, D.C. Metropolitan Area, provide overall leadership and direction to the programs and activities assigned to the Agricultural Research Service. The field activities are managed on a geographical basis through four Regional Offices, 19 Area Offices and seven major Research Centers. Research activities are carried out at 152 separate field locations. As of September 30, 1977, the Agency employed 8433 permanent full-time employees and 1,714 part-time employees.

Available Funds and Man-Years
1977 and Estimated, 1978 and 1979

Item	Actual 1977		Estimated 1978		Estimated 1979	
	Amount	Man-Years	Amount	Man-Years	Amount	Man-Years
Agricultural Research:						
Service:	a/	:	b/	:	:	:
Regular appropriation:	\$282,909,000	: 9,443	\$325,338,000	: 9,494	\$323,588,000	: 9,189
Scientific activities:						
overseas (Special						
Foreign Currency						
Program).....	7,500,000	: 15	5,750,000	: 9	7,500,000	: 9
Total.....	290,409,000	: 9,458	331,088,000	: 9,503	331,088,000	: 9,198
Deduct allotments to:						
other agencies.....	-1,815,108	: -16	-1,965,000	: -19	-1,330,000	: -4
Net.....	288,593,892	: 9,442	329,123,000	: 9,484	329,758,000	: 9,194
<u>Obligations under</u>						
other USDA appropri-:						
ations:						
Animal and Plant						
Health Inspection						
Service--emergency						
Programs and field						
station services..	4,090,413	: 128	3,587,313	: 125	3,587,313	: 125
Food and Nutrition						
Service--improved						
dietary nutrition	2,333,270	: 18	375,000	: 18	375,000	: 18
National Agricul-						
tural Library--						
various services....	286,361	: 1	135,400	: 1	135,400	: 1
Soil Conservation						
Service--field						
station services ...	307,457	: 9	242,384	: 6	242,384	: 6
Economic Research						
Service--including						
P.A.S.A. and						
training of foreign						
nationals	1,866,585	: 35	3,323,800	: 48	3,323,800	: 51
Agricultural Market-:						
ing Service--field						
station services ...	87,470	: 1	45,466	: 1	45,466	: 1
Foreign Agricultural						
Service--various						
services.....	34,315	: 1	--	: --	--	: --
Federal Grain						
Inspection Service--						
various services ...	48,652	: 1	62,086	: 1	62,086	: 1
Food Safety and						
Quality Service--						
field station service	313,440	: 1	497,884	: 2	497,884	: 2
Coordinated Depart-:						
mental Services	144,030	: 6	115,000	: 4	115,000	: 4
Miscellaneous						
reimbursements	13,925	: --	722,615	: --	722,615	: --
Total other USDA						
Appropriations	9,525,918	: 201	9,106,948	: 206	9,106,948	: 209
Total, Agricultural						
Appropriation	298,119,810	: 9,643	338,229,948	: 9,690	338,864,948	: 9,403

Available Funds and Man-Years 1977 and Estimated, 1978 and 1979
 (Continued)

Item	Actual 1977		Estimated 1978		Estimated 1979	
	: Man- :		: Man- :		: Man- :	
	Amount	Years	Amount	Years	Amount	Years
Other Federal Funds ...	\$ 10,058,997:	100:	\$ 13,382,722:	95:	\$ 13,382,722:	92
Non-Federal Funds	1,981,028:	36:	1,485,330:	36:	1,486,330:	36
Total, Agricultural Research Service	310,159,835:	9,779:	353,098,000:	9,821:	353,734,000:	9,531

	1977 <u>Actual</u>	1978 <u>Estimated</u>	1979 <u>Estimated</u>
End-of-Year Employment :			
Permanent full-time . :	8,433	8,350	8,100
Other :	1,433	1,290	1,250
Total included in ceilings	9,866	9,640	9,350
Number of disadvantaged :			
youth :	281	300	300
Total :	10,147	9,940	9,650

a/ Includes \$1,000,000 reappropriation.

b/ Includes \$2,000,000 reappropriation and excludes funds for the Competitive Grant Research Fund in the amount of \$15,000,000 which is proposed to be a transfer in the estimate to the Cooperative State Research Service in FY 1979.

Agricultural Research Service

Appropriation Act, 1978		\$324,859,000
Budget Estimate, 1979		<u>323,588,000</u>
Decrease in appropriation		<u>- 1,271,000</u>

Adjustments in 1978:

Appropriation Act, 1978	\$324,859,000	
Transfer in Estimate	-15,000,000	^{a/}
Special Fund Reappropriation	+2,000,000	
Supplemental Appropriations:		
Pay Costs	+13,479,000	
Adjusted base for 1979		325,338,000
Budget Estimate, 1979		<u>323,588,000</u>
Decrease over adjusted 1978		<u>- 1,750,000</u>

a/ Transfer in the Estimates of the Competitive Research Grants to the Cooperative State Research Service.

SUMMARY OF INCREASES AND DECREASES
(on basis of adjusted appropriation)

<u>Item of Change</u>	<u>1978</u> <u>Estimated</u>	<u>Increase or Decrease</u>		<u>1979</u> <u>Estimated</u>
		<u>Pay Costs</u>	<u>Program Changes</u>	
Research on Housing ...	\$ 389,000	- -	\$ -389,000	\$ - -
Crop Production				
Efficiency Research .	118,935,000	+90,000	+5,000,000	124,025,000
Tropical and Subtropical Agricultural Research	793,000	- -	-343,000	450,000
Research on Conservation and Use of Land and Water Resources and Maintaining Environmental Quality	27,665,000	+22,000	+3,884,000	31,571,000
Processing, Storage and Distribution				
Efficiency Research	57,839,000	- -	-9,431,000	48,408,000
Human Nutrition Research	15,500,000	+9,000	+7,884,000	23,401,000
Research to Improve Human Health and Safety	12,025,000	+9,000	+434,000	12,468,000
All Other	<u>83,209,000</u>	<u>+56,000</u>	<u>- -</u>	<u>83,265,000</u>
Total, Program Changes	316,363,000	+186,000	+7,039,000	323,588,000
Facility Change:				
Elimination of Non-recurring Facility Items	<u>8,975,000</u>	<u>- -</u>	<u>-8,975,000</u>	<u>- -</u>
Total Available	<u>\$325,338,000</u>	<u>\$+186,000^{a/}</u>	<u>\$-1,936,000</u>	<u>\$323,588,000</u>

a/ Includes increase of \$186,000 for annualization of pay increases, effective FY 1978.

PROJECT STATEMENT
(on basis of adjusted appropriation)

	1977	1978 (Estimated)	Increase or Decrease	1979 (Estimated)
<u>1. Research on animal production:</u>				
(a) Animal production				
efficiency research ...	\$56,714,810	\$60,483,000	\$ +45,000	\$60,528,000
(b) Research on housing	<u>355,339</u>	<u>389,000</u>	<u>- 389,000</u>	<u>- -</u>
Total, Research on animal production	57,070,149	60,872,000	-344,000(1)	60,528,000
<u>2. Research on plant production:</u>				
(a) Crop production				
efficiency research ...	104,394,443	118,935,000	+5,090,000	124,025,000
(b) Tropical and subtropical agricultural research .	<u>683,388</u>	<u>793,000</u>	<u>- 343,000</u>	<u>450,000</u>
Total, Research on plant production	105,077,831	119,728,000	+4,747,000(2)	124,475,000
<u>3. Research on the use and improvement of soil, water, and air:</u>				
(a) Research on conservation and use of land and water resources and maintaining environmental quality	24,779,474	27,665,000	+3,906,000	31,571,000
(b) Research on watershed development	<u>9,733,018</u>	<u>10,289,000</u>	<u>+9,000</u>	<u>10,298,000</u>
Total, Research on the use and improvement of soil, water, and air	34,512,492	37,954,000	+3,915,000(3)	41,869,000
<u>4. Processing, storage, distribution, food safety, and consumer services research:</u>				
(a) Processing, storage and distribution efficiency research	52,642,322	57,839,000	- 9,431,000	48,408,000
(b) Research to expand agricultural exports	2,225,956	2,596,000	+2,000	2,598,000
(c) Research to improve human health and safety	11,980,928	12,025,000	+443,000	12,468,000
(d) Research on consumer services	<u>560,024</u>	<u>625,000</u>	<u>- -</u>	<u>625,000</u>
Total, Processing, storage and distribution, food safety, and consumer services research	67,409,230	73,085,000	- 8,986,000(4)	64,099,000
<u>5. Research on human nutrition:</u>	13,244,943	15,508,000	+7,893,000(5)	23,401,000
<u>6. Construction of facilities</u>	450,000	8,975,000	- 8,975,000(6)	- -
<u>7. Repair and maintenance of facilities and equipment</u>	<u>a/</u>	<u>8,216,000</u>	<u>- -</u>	<u>8,216,000</u>
<u>8. Contingency research fund</u>	<u>b/</u>	<u>1,000,000</u>	<u>- -</u>	<u>1,000,000</u>

	1977	1978 (Estimated)	Increase or Decrease	1979 (Estimated)
Unobligated balance	<u>5,144,355</u>	---	---	---
Total, Available or estimate ..	282,909,000	325,338,000	<u>-1,750,000</u>	<u>323,588,000</u>
Transfer in Estimate to				
CSRS	--	+15,000,000		
Reappropriation	-1,000,000	-2,000,000		
Pay Costs	--	<u>-13,479,000</u>		
Total, Appropriation	<u>281,909,000</u>	<u>324,859,000</u>		

a/ Obligations for the \$3,312,000 appropriated in 1977 are included in the projects above.

b/ Obligations for the \$1,000,000 appropriated in 1977 are included in the projects above.

EXPLANATION OF PROGRAM

Under the Agriculture and Related Agencies Appropriation Act of 1978, the Agricultural Research Service carries out the following activities:

1. Research on animal production.--Research is conducted to improve livestock productivity (including poultry) through improved breeding, feeding, and management practices and to develop methods for controlling diseases, parasites, and insect pests affecting them.
2. Research on plant production.--Research is conducted to improve plant productivity through improved varieties of food, feed, fiber, and other plants; develop new crop resources; and improve crop production practices, including methods to control plant diseases, nematodes, insects, and weeds.
3. Research on the use and improvement of soil, air, and water.--Research is conducted to improve the management of natural resources, including investigations to improve soil and water management, irrigation and conservation practices; to protect natural resources from harmful effects of soil, water, and air pollutants and to minimize certain agricultural pollution problems, and to determine the relation of soil types and water to plant, animal, and human nutrition. The research includes studies on hydrologic problems of agricultural watersheds. Research is also conducted on the application of remote sensing techniques in meeting agricultural problems, and on effects of the reduction of ozone.
4. Processing, storage, distribution and food safety research.--Research is conducted to develop new and improved fabrics and industrial products and processes for agricultural commodities for domestic and foreign markets, including ways to minimize processing wastes. Research is conducted on the processing, transportation, storage, wholesaling and retailing of products.

Research is conducted on problems of human health and safety, including means to insure the safety of food and feed supplies; control insect pests of man and his belongings; and reduce the hazards to human life resulting from pesticide residues and other causes.

5. Human nutrition research.--Research is conducted on human nutritional requirements and the composition and nutritive value of food as needed by consumers and by Federal, State and local agencies administering food and nutrition programs.

The research performed by the Agricultural Research Service is authorized by the Department of Agriculture Organic Act of 1862 (5 U.S.C. 511) and the Research and Marketing Act of 1946, as amended (7 U.S.C. 427, 427i).

JUSTIFICATION OF INCREASES AND DECREASES

(1) A decrease of \$344,000 for research on animal production consisting of:

- (a) An increase of \$45,000 for annualization of pay increases effective in FY 1978.
- (b) A decrease of \$389,000 in research to improve rural communities (\$389,000 available in FY 1978).

The decrease eliminates research on rural house construction. Under this program, research was conducted on (1) house design, (2) structural components, (3) construction techniques for "do-it-yourselfers", (4) insulating methods, (5) greater use of solar and wind energy, and (6) rural water and waste systems. This has been a very small research program over the past several years (4 scientist years). Other Departments and institutions are now committing substantial resources to similar programs that could easily replace the research being conducted under this program.

(2) A net increase of \$4,747,000 for research on plant production consisting of:

- (a) An increase of \$90,000 for annualization of pay increases effective in FY 1978.
- (b) An increase of \$3,500,000 for extramural research on improving small-scale farm production.

Objective: To develop and field test effective multicropping systems for typical small-scale producers, to develop low-energy input systems for small-scale producers, including maximum use of organic residues; develop insect and disease resistant varieties, production practices and equipment suitable for small-scale farming systems.

Need for Increase: This new program contributes a research component to an overall Departmental program targeted toward small farms. It will make use of expertise and information developed by ARS and others to meet the general technological needs of agriculture. There are estimated to be 1.7 million small farms in the U.S., operating 38 percent of the land in farms but producing only 10 percent of all agricultural output. This resource base can be made much more effective with technology tailored specifically for the special conditions affecting small agricultural operations many of which are operated by retirees, 40 hours per week job holders, unemployed, handicapped, and home gardeners. This research is necessary, therefore, to develop varieties, energy conserving technology, and information unique to small and part-time farmers and gardeners for efficient production and preservation of agricultural products, thus conserving scarce sources of energy and improving the efficiency of American agriculture and the income and well being of rural Americans.

Developing a national data base, furthermore, to embrace and utilize local and regional information will be necessary to avoid duplication and fragmentation of effort. Research teams and a national data base will provide for a systematic method for guiding small-scale producers in selecting the most appropriate technology for using their personal and natural resources to meet realistic production and goals.

A system for choosing cropping practices will enable the small operator to make more productive investments, increase income substantially and contribute to local and thus national food supplies. Locally produced food will have large energy and environmental savings over processed and packaged produce coming from far away production areas. The applicability of ARS research to home gardens and to developing countries will increase. Small-scale multicropping units producing for local needs require many more complex decisions than large-scale monoculture farms.

A systematic national approach to draw together a multiplicity of research data and uncover directions for new research is needed. Improved efficiencies for these producers will contribute to national food production. This research will integrate closely with inhouse research on production efficiency.

Plan of Work: Research in selected areas will be conducted extramurally to augment or supplement and strengthen inhouse programs using expertise, facilities, and equipment at universities, in the private sector or in other research agencies. The work will be consistent with ARS missions and National Programs. Proposals will be solicited, and selections will be made, on the basis of utilizing the best facilities and expertise in the U.S.

Units will be established where appropriate cadres of scientists currently are located. The research units will make comparisons of the effectiveness of "organic" farming systems, current technology and various combinations of these, including integrated pest management systems. Major thrusts of the program will be to develop: (1) alternate production systems for small-scale farmers and (2) a production decision methodology for small-scale production units.

Specific plans include developing: (1) guidelines and procedures for producers to select among small-scale farming systems; (2) optional prototype small-scale systems for various parts of the country and (3) a methodology for comparing and selecting production systems based on producers' income needs, lifestyle goals, and resource availability.

(c) An increase of \$1,500,000 for extramural research on integrated pest management.

Objective: To develop a better understanding of host-pest interaction and weed-crop competition for the purpose of reducing losses caused by crop pests while maintaining environmental quality through integrated pest management systems. Specific objectives are to quantify interactions among hosts, pests, and natural enemies of pests, and soil and climatic factors.

Need for Increase: Pests cause losses to crops alone in excess of \$10 billion annually. Several recent national and international studies emphasized the need to reduce these losses. Every item in this program has been recommended for priority attention by one or more of the above studies and contributes to the overall Departmental Program to develop effective pest control technologies that are economical, environmentally and ecologically sound, and socially acceptable. By increasing the understanding of the relationship among hosts, pests, and natural enemies of pests, improved integrated pest control strategies will be developed. The new knowledge developed will provide leads to future control technologies in integrated pest management and to maintaining environmental quality.

Plan of Work: Research in selected areas will be conducted extramurally to augment or supplement and strengthen inhouse programs using expertise, facilities, and equipment at universities, in the private sector or in other research agencies. The work will be consistent with ARS missions and National Programs. Proposals will be solicited, and selections will be made, on the basis of utilizing the best facilities and expertise in the U.S.

The major thrust will be to increase our knowledge of host-pest and weed-crop competition. Examples include the major physical, chemical, and microbiological factors in the soil that tend to suppress root feeding insects and nematodes; elucidate fundamentals of weed-crop interactions including allelopathic effects between weeds and grain crops, the primary and secondary chemicals that influence grain crops, the primary and secondary chemicals that influence competition, and the use of basic information to selectively control weeds; and determine the mechanism by which hosts attract or repel pests.

(d) An increase of \$3,106,000 in crop production research

Objective: To develop new or improved agricultural practices in integrated pest management to safeguard the environment, to develop improved plant varieties that are tolerant to moisture and climatic stresses, and other studies to reduce cost of crop production.

Need for Increase: Despite current pest control efforts, crop production losses caused by pests exceed \$10 billion annually, and climatic factors cause stresses to crops that further reduce yields. Several recent national and international studies emphasize the need to reduce these losses while conserving water and improve the quality of the environment.

Plan of Work: Funds will be used for new thrusts on development of practical methods for biological control of pests, new knowledge of host plant resistance to pests, and development of crops tolerant to environmental and physical stresses in non-irrigated agriculture, and other studies aimed at reducing costs of crop production.

(e) A decrease of \$3,106,000 in tobacco production research

As a result of a review of research programs and priorities, all of ARS tobacco production research will be terminated and the related resources redirected to other high priority plant production research, primarily in the areas of integrated pest management, improved varieties, and production cost reductions. Tobacco production research being discontinued emphasized: (1) development of new genetic stock of tobacco, and improved cultural, harvesting, curing, and management practices that reduce undesirable constituents and maximize quality attributes, including physical characteristics; and (2) new and improved genetic populations, breeding lines, and varieties of tobacco that combine high yield potential, better resistance to pests, tolerance to environmental stress, and adaptation to mechanized culture, curing, harvesting, and handling that minimize production losses and use scarce resources efficiently.

The Agency will continue to perform health related tobacco research.

(f) A decrease of \$343,000 in tropical and subtropical agricultural research (\$793,000 available in FY 1978).

The decrease would reduce the research effort on germplasm collection, evaluation, breeding and distribution for use in tropical and subtropical environments; developing technologies for use of tropical-subtropical soil and water resources; and on production systems developed for tropical and subtropical areas benefiting Hawaii and Puerto Rico and those geographic areas in other countries with similar problems. Research to be reduced affects areas of limited geographic scope. Also, States and/or industrial institutions are currently conducting research on similar programs.

(3) An increase of \$3,915,000 for research on the use and improvement of soil, water, and air consisting of:

(a) An increase of \$31,000 for annualization of pay increases effective in FY 1978.

(b) An increase of \$3,884,000 for extramural research to conserve energy in farm production and manage climatic stress (\$27,665,000 available in FY 1978).

Objective: To reduce energy usage and increase the efficiency of water usage in agriculture by developing: (1) more efficient on-farm systems and improved water distribution and storage systems and irrigation operating criteria, better ways to use all sources of water; (2) alternative irrigation policies for drought years; (3) increased water-use efficiency of rain-fed agriculture; (4) evaluations of using agricultural water supplies for energy development; (5) ways to reduce consumption of fossil fuels for tillage; and (6) increased efficiency of nitrogen fertilizer use, thereby reducing energy use.

Need for Increase: The technologies envisioned will insure that soil and water resources needed to meet domestic and export demands for food, feed and fiber are available over the long-term and that production inputs will be combined in ways that are environmentally, ecologically, and economically sound.

ARS scientists long have led in the fields of irrigation and drainage research, developing the computerized irrigation scheduling system now used on 600,000 acres and the laser-beam guidance system used to lay plastic drain tile (and to level land and grade highways as well). The great stability imparted to U.S. agricultural production by irrigation of dry soil and drainage of wet soils is not generally realized. Extended drought and continued energy shortages indicate that these areas of research must take on increased significance if food supplies and prices are to be maintained.

The success of past tillage research (State, industrial, and federal) is shown by the great speed and effectiveness with which U.S. farmers till the land and plant their crops. However, energy costs and long-term shortages of fossil fuel, plus increasing constraints on soil erosion, impose a whole new dimension and urgency for tillage research. The use of larger, more powerful equipment dictates new soil management strategies to prevent soil compaction and erosion. No-till is not a cure-all. No-till and other conservation tillage techniques require great skill and precision and require a variety of costly equipment. Reduced costs of no-till often are offset by lower yields. There are many opportunities for improvements.

The hydrologic cycle can be modified in many ways to make better use of natural precipitation and the sun's energy. Terraces, grass barriers and wind breaks to catch snow, water spreading systems, and contour furrowing are some practical techniques developed by ARS for use on crop and rangelands. Other techniques hold promise for predicting water use (evapotranspiration) over large areas and for specifying when to irrigate crops.

Compared to other agricultural sciences, soil tillage, soil fertility, and plant nutrition research reached a high state of technology in the 1950's and early 1960's that was highly energy dependent. This, coupled with cheap fertilizer, led to declining support and substantial redirection of effort into environmental research. Interest in the nitrogen cycle and use of nitrogen-fixing legumes became almost nonexistent. High prices of fertilizer, energy scarcity, and concern for the possible adverse effects of nutrient elements (such as nitrates and nitrous oxides re atmospheric ozone depletion) have created a new urgency. We must make more efficient use of fertilizers and native soil fertility and gain a better understanding of how nutrients cycle through and modify the environment.

Plan of Work: Research in selected areas will be conducted extramurally to augment or supplement and strengthen inhouse programs using expertise, facilities, and equipment at universities, in the private sector or in other research agencies. The work will be consistent with ARS missions and National Programs. Proposals will be solicited, and selections will be made, on the basis of utilizing the best facilities and expertise in the U.S.

A major thrust will be made to develop energy-conserving irrigation, storage, distribution, and application systems; assess the adverse impacts of energy shortages and costs on irrigated agriculture and on the year-to-year stability of supplies of key irrigated crops; develop alternative strategies for irrigated agriculture during drought years to protect orchards and vineyards, to compensate for loss of hydroelectric power, and to stabilize commodity supplies. We also plan to promote new research on improved traction and floatation devices to reduce energy consumption in tillage.

A second thrust will be to quantify the effect of adverse weather and climate on major U.S. crops and devise means to avoid drought and other stresses through developing models that would accurately describe the quantitative relationships between growth of corn, soybeans, and sorghum, and climatic variables such as rainfall, soil moisture, temperature, and radiation; and through use of satellite imagery for assessing climatic variables and crop stresses. These areas of research were emphasized by the NAS World Food and Nutrition Study and other recent reports on food production needs.

Thirdly, a multidisciplinary team will coordinate extramural work to reduce use of and need for the nitrogen fertilizer now used on corn, the largest user. We will accelerate research to clarify soil-plant-animal relationships and effects of fertilizers on nutritional content of food and feed.

(4) A net decrease of \$8,986,000 for research on processing, storage, distribution, food safety, and consumer services research consisting of:

- (a) An increase of \$11,000 for annualization of pay increases effective in FY 1978.
- (b) A net decrease of \$9,431,000 in processing, storage and distribution efficiency research (\$57,839,000 available in FY 1978) as follows:

Research would be reduced on utilizing agricultural commodities to provide renewable resources for industrial chemicals, products, and textiles, animal oils and fats and on lowering the physical distribution costs of marketing swine while maintaining quality. Reductions will be made in the natural fiber technology programs, on flame retardancy of cotton and mohair research.

This reduction would eliminate the agribusiness staff, the national research program on marketing technology and facilities, and kenaf research. Also, marketing research on specialized commodities, e.g., wild rice and honey will be terminated. Research similar to many of these programs is currently performed by industrial institutions.

(c) An increase of \$434,000 for research to improve human health and safety (\$12,025,000 available in FY 1978).

Objective: Develop information on the composition, metabolic fate, mutagenicity, teratogenicity, and carcinogenicity of toxicants in the food and feed supply.

Need for Increase: These funds are necessary to insure that the public has food products free from harmful levels of both naturally occurring and added toxic residues originating from agricultural sources. The costs and lengthy periods required to obtain safety clearances are barriers to research progress that must be overcome. New protocols on food/feed safety evaluation are becoming extremely comprehensive, time consuming, and expensive. The evaluation of a single substance now costs two to three hundred thousand dollars and is increasing. The research to be conducted is designed to find a solution to this mounting problem.

A host of safety problems needing ARS attention has resulted from recent activities of regulatory agencies. The Water Quality Act requires reevaluation of drinking water standards. The Occupational Safety and Health Administration (OSHA) has in some instances lowered permissible atmospheric concentration of air pollutants by several orders of magnitudes. Permissible re-entry times for workers entering fields where pesticides have been applied are still of major concern. New regulations under the Federal Environmental Pesticide Control Act make it less attractive for industry to carry out toxicology and related studies required to register pesticides for use on minor crops. The Food and Drug Administration (FDA) has issued regulations placing limitations on the alteration of chemical composition of new crop varieties. FDA has also issued new regulations requiring laboratories performing safety evaluations to meet Federal standards of "good laboratory practice" which will govern everything from facilities and equipment to personnel and records. The new Toxic Substances Control Act, setting up an agency to monitor safety of chemicals not now covered by existing regulatory agencies, is also expected to broaden the base of chemicals whose safety ARS must evaluate.

Plan of Work: Ground work will be laid for a toxicological data bank which would contain data required by FDA on carcinogenicity, mutagenicity, and teratogenicity.

Funds will be used to improve the levels of competence and expertise in, and update facilities for, human toxicological research. The candidate substances for investigation are selected examples of trace constituents in vegetables from the following plant families: legume, nightshade, mustard, parsley, lily, which are suspected of having mutagenic, teratogenic, and carcinogenic activity. Dose responses, including metabolic fate and distribution studies on small animals, will be conducted.

(5) An increase of \$7,893,000 for research on human nutrition consisting of:

- (a) An increase of \$9,000 for annualization of pay increases effective in FY 1978.
- (b) An increase of \$2,884,000 for research on human requirements for nutrients (\$15,508,000 available in FY 1978).

Objective: To identify and appraise the nutritional needs and nutritional state of individuals and groups at different stages of life and the consequences of inadequate nutrition. Devise techniques and equipment to guide consumer selection of food. Develop research-based knowledge on food management and processing procedures and methods of preparing foods to retain nutritional and eating qualities and to avoid food-borne illness.

Need for Increase: The inadequate knowledge of nutrient needs at various stages in life hinders dietary guidance to families. This information is needed by consumers in general and by Federal, State, and local agencies administering food and nutrition programs to improve food habits, satisfactions, and nutritional levels in human diets.

The consequences of inadequate nutrition are numerous. In the United States, they are associated with a high death rate in men due to coronary atherosclerosis. In some children impaired growth and development are related to poor nutrition. It is possible that retarded intellectual function of some children is related to poor maternal nutrition during pregnancy. Poor maternal nutrition has been implicated as a cause of abortion and intra-uterine growth retardation. Morbidity and mortality of individuals may be significantly affected by nutritional status often due to a poor understanding of nutrient requirements. In developing countries malnutrition is a major cause of morbidity, mortality, and lack of productivity.

Although overt deficiency diseases like pellagra and scurvy have all but disappeared in the United States, major nutrition-related health problems like heart disease still exist. Moreover, research is now implicating certain dietary factors like fat and lack of fiber in the diet with some forms of cancer. Estimates of annual economic cost of cardiovascular disease alone range from \$20 to over \$30 billion. Thus, there is urgent need to investigate the relation of fats, sugars, and dietary fiber to human nutrition and to help people make proper food choices to support health throughout life. The advent of nutritional labeling and the establishment of a Nutrient Data Bank has sharply emphasized that the available information on the nutrient content of foods is inadequate for present needs and that the present state of analytical methods for nutrient analysis of foods is unsatisfactory. Much of the existing data was obtained in the 1930's and early 1940's.

Plan of Work: The major thrust will be on human requirements for nutrients, specifically: what nutrients should be regulated through diet and how; the biological availability of these nutrients in food; and the identification of the health benefits for individuals or population groups who could benefit from alteration of nutrient intake. Program emphasis would be placed on requirements for proteins (vegetable), lipids (essential fatty acids), carbohydrates (fibers) and minerals (chromium, zinc, magnesium and calcium).

The inhouse research program activities would be supplemented by an extramural research program that would utilize the best nutrition facilities and expertise in the U.S.

(c) An increase of \$5,000,000 for extramural research to improve human nutrition

Objective: To develop new knowledge to improve dietary and nutritional status of mankind with emphasis on food preferences and food habits, nutrient composition of foods, and techniques and equipment to guide consumer selection of food.

Need for Increase: A national goal of the USDA is the provision of foods to assure adequate diets for all. Nutrition equates to food and only through foods can man manipulate and regulate his nutritional well being. This role must be assumed by USDA as the only Department with responsibility for food production and the one with the largest coordinated intramural human nutrition research program in the United States. For example, nutrition research in NIH is oriented to the alleviation of disease symptoms and diet therapy for medical and surgical patients; AID is concerned with protein-calorie malnutrition of the developing countries. This program will supplement the Agency's on-going inhouse research on human nutrition.

Consumers receive through television and other advertising forms a vast amount of information on food selection. Nutrition educators need information about food habits, choice and motivations in order to assist consumers in making nutritious food selections. Additional data on the nutrient composition of foods will be developed to supplement tables currently available, and expand the Nutrient Data Bank. Nutritionists require this data to translate nutritional needs into food selection and food selection patterns. In addition to knowledge of what constitutes a nutritious diet, consumers need guidance on how to convert available foods into appealing nutritious meals.

Recent world food studies and reviews, including the recent World Food and Nutrition Study of NAS, have given top priority to improvement in human nutrition; some of these specifically recommend the major thrust be located in USDA as the only Department engaged in preventative nutrition and its research.

Plan of Work: Research will be conducted extramurally to augment or supplement and strengthen inhouse programs using expertise, facilities, and equipment at universities, in the private sector or in other research agencies. The work will be consistent with ARS missions and National Programs. Proposals will be solicited, and selections will be made, on the basis of utilizing the best facilities and expertise in the U.S.

The major thrust in this program will be the development of up-to-date information and guidance materials for nutrition educators and consumers to improve the nutritional status of the American people through diet. The proposed increase would provide for increasing the cost-effectiveness and speeding up achievement of the targets of the Nutrition Composition Laboratory (development of analytical methods and analyses), provide an expansion of the Nutrient Data Bank, and allow the acquisition of needed data on nutrient content of meats, and fresh fruits and vegetables. This would help to identify and appraise the nutritional properties and contributions of foods including the study of fresh and processed foods; assess bioavailability and chemically useful forms of nutrients in foods; and determine and evaluate nutritional antagonists in foods.

Techniques and equipment will also be developed to aid the retention of nutritional and eating qualities of food in the home or in institutions, i.e., develop research-based knowledge on food management procedures and methods of preparing foods to retain nutritional and eating qualities to avoid food-borne illness.

(6) A decrease of \$8,975,000 to eliminate non-recurring facility items (\$8,975,000 available in FY 1978).

The 1979 Budget Estimates provide for a decrease of \$8,975,000 to eliminate non-recurring amounts provided for construction of facilities in 1978 which are not needed in 1979. These items are as follows:

<u>Item</u>	<u>1978 Amount</u>
<u>Planning</u>	
(1) North Central Regional Dairy Forage Research Center Madison, Wisconsin	\$1,100,000
(2) Nutrition Laboratory, Tufts University Medford, Massachusetts	2,000,000
(3) Soil and Water Laboratory, Purdue University West Lafayette, Indiana	400,000
(4) Feasibility Study of Plant and Moisture Stress Laboratory	100,000
<u>Construction</u>	
(1) Addition, Human Nutrition Laboratory Grand Forks, North Dakota	3,500,000
(2) Feed Mill replacement, Research Center El Reno, Oklahoma	1,500,000
(3) Greenhouse, Northern Great Plains Research Station Mandan, North Dakota	375,000
TOTAL, Items above	<u>\$8,975,000</u>

STATUS OF PROGRAM

The Agricultural Research Service (ARS) is a mission-oriented agency concerned with research to ensure an abundance of high-quality, nutritious, reasonably priced food and other agricultural products to meet the needs of an expanding domestic and world economy while maintaining environmental quality. The Service uses coordinated, interdisciplinary approaches to conduct basic, applied, and developmental research in the fields of livestock, plants, soil-water-and-air resources, environmental quality, energy, processing, storage and distribution efficiency, food and nutrition, consumer services, international development, and agriculturally related health hazards, including food safety.

Research is conducted at more than 150 locations in the States, Puerto Rico, Virgin Islands, and several foreign countries. Much of the research is conducted in cooperation with the State agricultural experiment stations, other State and Federal agencies, and private institutions.

RESEARCH ON ANIMAL PRODUCTION

Current activities: Research is conducted to improve the efficiency of producing high-quality animal and animal products through improved genetic and reproductive capacity, feeding and management practices including the use of noncompetitive feed sources, equipment, and energy use, and to develop better methods for controlling diseases, parasites, insects, and other pests and hazards.

As the production of animal and animal products continues to increase in the United States and the world, new technology is needed to enable livestock producers to increase production and thus to assure a reliable supply of animal protein and at the same time reduce production costs. In most cases these reduced costs are passed on in the marketplace to the consumer as lower prices of meat and other animal products. Improved reproductive capacity, control of specific animal diseases now presenting major problems, and control of pests and hazards through environmentally safe practices are areas of research being emphasized. Special attention is given to fundamental research as well as the possible use of production practices to alter the composition of animal products for the benefit of consumers. The following are selected examples of recent progress in animal production efficiency research.

Selected examples of recent progress:

Cholesterol Level in Egg Yolks Reduced. Through genetic selection of hens for high and low levels of yolk cholesterol for three or four generations, a 6-8 percent difference between high and low lines resulted. High dietary fiber levels furnished mainly by sunflower meal resulted in a 13 percent decrease in the level of yolk cholesterol. These findings are important in minimizing cholesterol levels in eggs.

Reducing Grain in Beef Finishing Rations Minimizes Excess Carcass Fat. ARS scientists increased lean meat 5-10 percent in animals fed lower-than-usual grain levels and slaughtered at the same live weight as conventionally fed animals. Application of these findings will permit production of more highly palatable edible meat without increasing numbers fed and at the same time reducing grain use.

Prolific Finn-Cross Ewes Greatly Increase Lamb Production. Finnsheep crossbred ewes produced 28 percent more lean lamb meat per ewe than commonly used crossbred, and 54 percent more than the average produced by six domestic breeds at Clay Center, Nebraska. Use of Finnsheep bloodlines increased the lambing rate and, thus, the net returns of producers.

Test for Identifying Cattle Virus Developed. A rapid, sensitive, accurate test to identify cattle infected with bovine leukemia virus has been developed at the National Animal Disease Center and is now commercially available. The elimination of this virus would save at least \$6 million annually for the livestock industry. Also, this development contributes valuable knowledge to the study of human cancer.

Technique Developed for Diagnosing Paratuberculosis in International Use. A culture method was developed at the National Disease Center, Ames, Iowa, for detecting the bacillus responsible for paratuberculosis (Johne's disease), a slowly developing, usually fatal disease of cattle, sheep, and goats. The disease is not responsive to treatment. Annual losses from this disease are estimated at \$60 million. By early detection diseased animals can be segregated from healthy animals to minimize further spread of the disease.

Mechanism of Mammary Gland Opening Observed. A technique developed by ARS scientists at Beltsville, Md., permits them to observe the teat canal of the mammary system of a dairy cow from inside the teat. The canal is observed through a flexible bundle of optical fibers during experimental milking by conventional or new milking equipment under development. This technique is very important for studying the cause of losses in milk production.

Vaccine Found Safe to Use on Pregnant Cows. A killed-virus vaccine developed by ARS scientists to control diarrhea is safe and effective for use in cows in all stages of pregnancy. This disease, plus other intestinal diseases, results in \$400 million annual losses which in part will be reduced by this vaccine. In addition, the development of this vaccine is important to future studies for controlling other intestinal diseases.

Rapid Test for Diagnosis of Transmissible Gastroenteritis (TGE) in Swine Developed. A rapid, simple, economical diagnostic test developed by ARS scientists speeds detection of swine infected with TGE virus. Neither sophisticated equipment nor techniques are required for these tests. This highly contagious disease causes nearly 100 percent mortality in pigs less than 7 days old. Annual losses are estimated at \$32 million.

Mechanism of Vaccine Immunity and Reasons for Vaccine Failures Identified. In certain flocks, vaccination fails to induce the expected immunity to Marek's disease. The number of vaccine failures has increased recently and has cost the industry more than \$40 million annually and has devastated poultry production in some areas. ARS scientists have identified the type of body cells that induce immunity and found that certain vaccine-derived viruses are sensitive to heat.

Increase of Livestock Insect Control Effectiveness up to 98 Percent Found Possible. Livestock insect control has been increased by use of a bolus (a very large pill that remains in stomachs of cattle) containing certain insecticides that are released very slowly. The insecticides pass through the animal and effectively control the horn fly and face fly for up to 16 weeks. Thus, one or two treatments during the season will control these fly pests.

New Test for Diagnosis of Pseudorabies in Swine Developed. An accurate, rapid, simple, economical diagnostic test was developed at the National Animal Disease Center for the detection of swine that have been infected with pseudorabies virus. Positive swine show a precipitation reaction in a hardened gelatin-like material (agar). The test should be a great aid in controlling the spread of the disease by preventing movement of possible carrier swine into clean herds.

New Method for Screwworm Population Reduction Developed. Inexpensive, small, cylindrical devices are distributed by air; adult screwworms are attracted to the device by the attractant, feed on the bait that contains the toxicant, and then die. By reducing the adult screwworm population before the release of sterile males, the screwworm eradication program will be less expensive than it has been and will proceed more rapidly.

New Electric Fence Proves Coyote Proof and Safe. An electric fence tested and refined by ARS scientists at Dubois, Idaho, has proved 100 percent effective in protecting sheep from coyotes. It generates a shock that does not harm either coyotes, dogs or sheep that brush against it. The cost is lower than that for the construction of a new conventional sheep fence.

Electrical Standards for Sprinkler Irrigation Systems Adopted. Through ARS research at Lincoln, Nebraska, electrical safety standards were developed for the manufacture and installation of irrigation equipment. Most manufacturers now adhere to the standards. To date, three states have incorporated these standards into their safety programs.

Foot-and Mouth Disease Virus in Milk Inactivated. The currently accepted processing of milk, high-temperature/short-time (72 C. for 15 seconds), does not inactivate this virus infected milk. Recent ARS studies show that ultra-high-temperature processing (148 C for 2-2 1/2 seconds) inactivates the virus. The ability to inactivate the virus in milk could be very important in preventing the spread of this disease by the infected milk.

Diagnosis of Ornithosis in Turkeys Improved and Effective Vaccine Developed. ARS scientists have developed an improved diagnostic technique and an effective vaccine for use in turkeys for a bacterial disease transmissible to man as psittacosis. The bacterium also causes ornithosis in turkeys, pneumonia in sheep and cattle, abortion, polyarthritis, and fatal enteritis. This technique and vaccine will reduce the threat of infection in humans, especially those working in processing plants.

Limestone Added to Dairy Cow Rations Increases Milk Production. The use of limestone at the rate of 2.25 percent as a buffer with lactating dairy cows resulted in a more favorable intestinal tract for use of starch and plant cell walls and thus improved the digestibility of dry matter. Digestion trials were conducted with mixed rations consisting of 60:40 forage:concentrate dry matter ratios. This use of limestone has potential for improving the efficient utilization of both concentrates and forages.

Irrigation Scheduling Reduces Power Costs, Promotes Efficiency. ARS, in cooperation with the Rural Electrification Administration, has developed the control technology to cut off electric power to irrigation systems when demands on a cooperative's ability to supply energy are excessive. The technology has been adopted by some cooperatives. Results reduce energy use, promote more efficient water use, reduce power costs to irrigators, and help power suppliers meet customer demand without expansion of generation and transmission capacity.

RESEARCH ON PLANT PRODUCTION

Current activities: Research is conducted to improve productivity, reliability and quality of food, feed, forage, and fiber crops; florist and nursery crops; rangelands; and turf. Similar work is being done in related areas of tropical and subtropical agriculture. The emphasis is on improved genetic stocks and varieties; optimized yields and quality of crops; improved mechanization and crop production practices; enhanced environmental quality; improved crop protection technology, including biological and chemical methods of controlling diseases, nematodes, insects, and weeds; and alleviation of the effects of drought and temperature stresses through the development of hardier plants.

New methods of increasing productive capacity through multidisciplinary approaches have been initiated. Special emphasis is being placed on improving basic photosynthetic processes in plants, natural nitrogen-fixing processes in soils and plants, better use-efficiency of both renewable and nonrenewable energy resources, and genetic and chemical regulation of plant growth and development processes.

The quality of our environment can be improved by the development, appropriate use, and care of attractive shelterbelt screening, ornamental trees, shrubs, turf, ground covers, and flowers. An estimated 75 million acres of cropland are affected by wind erosion, the adverse effects of which could be reduced

by shelterbelt screening. New and improved methodologies in this area are needed by rural and urban property owners throughout the nation.

Selected examples of recent progress:

Home-Garden Lettuce Variety Developed. A new crisphead lettuce variety 'Centennial' has been developed by ARS and the University of California for home gardeners. It has high-quality heads with excellent flavor. Centennial is smaller than other crisphead types but its internal head structure makes it easy to use individual leaves.

Important Potato Variety Released. This new, long potato variety (Butte) outyields the popular Russet Burbank variety by 5 to 30 percent and has 50 percent more vitamin C and more protein. It has been jointly released for fresh-market and processing use by ARS and the Idaho, Oregon, and Washington Agricultural Experiment Stations. Butte is resistant to several viruses to which Russet Burbank is susceptible.

Breeders Find Corn Strains Resistant to Aflatoxin. ARS breeders have found that corn varieties may inherit resistance to both the causal fungus and the development of the toxin. Resistance to insect damage is also being sought to reduce natural infection of the grain by the fungus. Millions of dollars of damage was caused to the 1977 corn crop in a few states by high levels of aflatoxin in the grain. By developing these resistances into future corn crops the losses from this type of damage could be significantly reduced.

Basic Research Explains Important Plant Biochemical Actions. The chemical alteration of a plant's fatty acids alters the plant's response to temperature stress. The higher the linolenic acid content the higher the tolerance to low temperatures, and vice versa. This basic information opens new approaches to selective weed control and to breeding of plants for temperature stress.

Key Found to Unlock Palatability Problem of Reed Canarygrass. Acceptance of reed canarygrass by cattle and sheep has been related to the level of alkaloid concentrations in the grass. The higher the alkaloid content the lower the palatability. A low alkaloid variety is being developed by ARS of this highly productive, drought tolerant, cool season grass, with potential adaptation to wetter-lands as well as uplands in the upper midwest and northeast.

Differences in Drought Tolerance of Sorghum Varieties Identified. ARS scientists have identified the two different plant mechanisms involved in withstanding heat and water stresses. This basic research opens avenues for agronomists and plant breeders to develop productive varieties of sorghum for use in semiarid climates.

New Forage Variety Derived from Annual Ryegrass and Tall Fescue. 'Keny' tall fescue is the first hybrid derivative between annual ryegrass and tall fescue. It combines the superior attributes of both plant species and has higher yield and digestibility than the current Kentucky 31. It could gradually replace the present forage grasses, giving higher cattle gains at no increase in cost to the farmers.

New Alfalfa Variety Developed for Resistance to New Aphid Pest. ARS scientists have developed and released a new variety of alfalfa, CUF 101, that is resistant to the blue alfalfa aphid. The blue alfalfa aphid, a pest recently introduced into the United States from the Orient, has invaded alfalfa fields in California, Arizona, Nevada, Utah, New Mexico, Kansas, Idaho, and Oregon, and threatens to move across the Nation.

Parasite of the Banded Cucumber Beetle Found. A nematode that kills root destroying insects was found in banded cucumber beetles near Charleston, SC. This discovery opens the way for developing a natural biological control program against larvae of the banded cucumber beetle and the corn rootworm complex, both important pests to cucumber producers.

A Bacterial Insecticide to Control Corn Borers now Available. ARS research has resulted in the registration of the granular forms of the bacterium Bacillus thuringiensis for European corn borer control on field corn. This is an important step in the control of the European corn borer in the United States.

Improved Methods Developed for Purifying Insect Attractants. Insect sex pheromones and other attractants often perform only if they are highly purified. ARS scientists at Gainesville, Florida, have developed high resolution micro-analytical methods for analyzing the purity of the Japanese beetle pheromone as well as pheromones of other important pests. This discovery will improve the effectiveness of these control programs.

Basic Research Adds Knowledge of Plants' Natural Defense to Some Herbicides. Certain herbicides are converted by plants to nontoxic forms and stored by the plants in different ways. This conversion is one way plants tolerate herbicides, but subtle differences in plants' mechanisms for conversion of the herbicides provide the key to specific chemical control of selected weeds. This type of knowledge aids in protecting both the food supply and the environment.

Electrical Charging of Spray Droplets Improves Uniformity. ARS research indicates that the variability of droplet size of insecticides delivered by conventional spray nozzles can be greatly reduced by using multiorifice solid stream nozzles with electrical spray charging devices. The production of droplets of uniform size will reduce spray drift and improve deposition target areas. The result will be more effective pest control.

Improved Control of Wild Oat Developed. ARS scientists have found that a new experimental herbicide, diclofop, will control wild oat in wheat in a broader spectrum of climatic conditions than currently available herbicides. Also, they have shown that diclofop is detoxified by wheat, thus providing a greater margin of safety for selective control of wild oat. Wild oat losses in wheat yields are estimated at \$500 million annually.

Successful Fumigation Procedures for Sweet Cherries. Recent research has shown that fumigation of sweet cherries with methyl bromide results in complete mortality of codling moth eggs and larvae. The treatment has no damaging effects on quality or taste of treated fruits. These findings are expected to result in modification of current quarantine regulations.

preventing importation into Japan of U.S.-produced cherries. The potential market is estimated to have an initial value of \$2-5 million per year.

Nectariless Cottons Reduce Losses from Pink Bollworms in Arizona and California. Breeding stocks developed by ARS provided the germplasm that resulted in the recent commercial release of a variety lacking normal plant nectaries. The decreased boll damage and reduced need for insecticide increased growers' profits \$30 per acre.

Biological Control of a Serious Problem Weed. Rush skeletonweed now infests 500,000 acres in California and 1 million acres in Idaho. ARS and state researchers have cooperated to obtain and release spores of a plant rust fungus that has reduced skeletonweed stands 10-fold and plant height 2-fold in California. This type of biological control has potential as a solution to this weed problem.

New Method for Safer Chemical Control of Nematodes. A chemical that inhibits nematode egg formation in plant roots has been found. It affects only a few types of organisms other than nematodes and can be used as a seed treatment which is significantly less hazardous than routine broadcast applications.

The California Red Scale Sex Pheromone Has Been Synthesized. This breakthrough, development of a sex attractant for red scale, promises cumulative benefits estimated at \$9 million per year. Its use in west coast citrus production areas will make possible more accurate assessment of red scale populations, make possible a decrease in the number of sprays, make available a cheaper trap, and bring about a reduction in cost of surveys.

Predictive Models Improve Pest Management. Improved predictive models developed by ARS by using information from light traps and weather stations are being used in practical programs to predict outbreaks of the bollworm and tobacco budworm. These predictions are important tools for providing early warning of potential insect problems to farmers.

Improved Equipment Reduces Cost of Insect Rearing. Equipment was developed and assembled for a continuous in-line system that forms rearing trays, fills trays with insect diet, cools diet, implants insect eggs, covers trays and trims trays. This equipment can produce 300 filled and sealed trays per hour and reduces the cost of rearing containers by 75 percent. This improvement is very important to control programs requiring mass rearing of insects.

New Method for Rearing and Releasing Egg Parasites Reduces Cost. A new method for rearing and releasing parasites that attack the eggs of many pest caterpillars has been developed. This new method will reduce the practice of releasing the parasites from the air, and the additional cost associated with aerial release. The new method is currently being used in commercial mass rearing and release programs for controlling pests of several crops.

New Sugarbeet Storage Practices Reduce Storage Pile Losses. Research has shown that use of a computer simulation model to aid in managing storage-

pile temperatures can reduce respiration losses by 30 percent. Use of common fungicide can reduce loss of sugar from storage rot by 60-70 percent. These practices could save \$40 million in storage losses annually for the industry.

Mechanical Shake-Pruning Improves Pear Harvest. Shake-pruning pear trees in the late winter removed about 12 pounds of dead wood, decreased the trash in subsequent harvested fruit by 5 percent and increased fruit removal during harvest by 20 percent. Removal of wood and trash with shake-pruning also reduced fruit damage during harvest. Pruning costs were reduced from \$2.00 per tree for hand pruning to \$0.50 per tree for mechanical pruning.

Low Cost Pecan Harvester for Small Orchards. A pecan pickup device that mounts on a small garden tractor was developed and tested by ARS scientists in Georgia. This machine can harvest 400 pounds of nuts per hour and would be suitable for orchards up to 20 acres.

New Cotton Production System for Rio Grande Valley of Texas. Supervised insect control, short-season cottons, and improved water management was integrated into a cotton production system. The system reduced insecticide use by 40 percent, and substantially reduced energy requirements, maintained yields, and increased farmers' income by an estimate \$18.00 per acre.

New Equipment Developed for Injecting Chemicals into Trees. A portable, light-weight system has been developed and tested for injecting growth-regulating chemicals into shade trees for sprout-regrowth control. The injection equipment is air powered and introduces a precise volume of chemical into each injection site. It has potential for injecting chemicals into trees for control of diseases, insects, and other pests.

Potential Product for Coloring Foods Discovered in Flowers. A new coloring agent from Heavenly Blue Morning Glory flowers appears suitable for coloring beverages, gelatin, desserts, toppings, icings, and various dairy products, replacing banned dyes. Colors obtained range from blue through red. With this pigment a single natural compound can be used to easily obtain a wide range in color by adjusting acidity.

RESEARCH ON THE USE AND IMPROVEMENT OF SOIL, WATER, AND AIR

Current Activities: Research is conducted to improve the cropland, watershed rangeland and noncultivated areas of the U.S. through development of sound resource management practices. Research deals with many aspects of the environment and covers a wide range of natural resource uses involving complex ecological systems. Much of the research is oriented to developing cultural practices and cropping systems that assure efficient use of soil, water, and air resources while providing adequate protection for sustained use. Investigations include reducing salt damage to soils, crops, and water; improving irrigation and drainage of agricultural land; developing tillage practices for improving soil properties and crop growth, managing and using precipitation and solar energy for crop production; reclaiming and revegetating land areas disturbed by man; utilizing, managing and conserving soil fertility for increased production and nutritional quality of plants and animals; preventing pollution of and improving the quality of soil, water, and air; controlling water erosion, wind erosion and sedimentation; and conserving and managing agricultural water resources.

Soil, water, and air research includes unique programs that serve the needs of specific problem areas relating directly to agriculture but also having wide application for nonagricultural purposes. Some of these programs include the study of remote sensing techniques for crop yield prediction; energy conservation and use; effect of such climatic extremes as drought on crops, animals, and man's water needs; human and animal nutrition as influenced by chemical content of soil, water, and air; management of soils including disposal of waste from urban and agricultural sources; and improvement of water and air quality for rural communities.

Selected examples of recent progress:

New Irrigation System Developed for More Uniform Water Application. The system uses inexpensive, buried, thin-walled corrugated plastic pipe laterals with small plastic hoses to tree crops. Pressure head available from a surface ditch is often sufficient to operate the system. The system permits 95 percent uniformity in water application and the cost is comparable to commercial drip and sprinkler systems.

Groundwater Pollution Can be Minimized by Light, Frequent Irrigation. Light, frequent irrigations on sandy soil restrict loss of fertilizer nitrogen below the crop root zone as a potential groundwater pollutant and also save water and the energy to pump it. ARS scientists found that this technique can reduce water losses below the root zone as much as 40 percent.

Viruses are Removed from Sewage Water During Groundwater Recharge. No viruses were detected from wells below a field system used to recharge groundwater with sewage effluent. Most viruses were absorbed near the soil surface, but the surface layer did not show excessive viral buildup even under high loading rates. These results show that sewage water can be economically treated by applying it on land without contaminating groundwater resources.

Livestock Losses Due to Grass Tetany can be Reduced. Grass tetany, the deficiency of magnesium in livestock diets, affects an estimated 1 to 2 percent of the grazing animal population in the U.S. ARS research has identified multifaceted approaches to minimize animal losses due to grass tetany. These include supplementing animal diets, adding Mg to soil or foliage, proper N and K fertilization, and avoidance of monoculture pastures.

Nitrosamine Formation in Soils Unlikely. There has been recent concern that certain herbicides commonly used in conservation tillage could produce nitrosamines, a toxic chemical, when used with nitrogen fertilizers. ARS scientists found that nitrosamines formed only when very large amounts of sodium nitrite were added to soil containing the herbicides atrazine and butralin. Occurrence of such large amounts of nitrite in soils is unlikely. This basic information is important for soil management systems in which herbicides are used.

Soil Losses from Single Storms Can Now be Estimated. A new procedure has been developed for evaluating the erosion and sedimentation that results from a single storm passing over a watershed. The new procedure can be used for designing sediment control plans for agricultural areas and construction

sites and for identifying areas within watersheds where the greatest efforts should be made to control erosion, including nonpoint pollution from farmlands.

Automated Surface Irrigation Systems Save Time and Water. ARS has developed an automated irrigation system that enables more precise control of the amount of water applied to a field and reduces farm labor requirements. The system saved 25 to 50 percent in water used, and generally crop yield improved by the same percentage. The system is centrally controlled by a clock that signals changes in soil moisture according to pre-set times.

Crop Residue Needed to Control Erosion Can be Estimated. A team of ARS soil scientists and engineers have developed a predictive capability for estimating crop residue needs to adequately control water and wind erosion, to control water runoff, and to protect the quality of surface waters. This computer model will be invaluable in planning for best use of crop residues.

Contour Furrowing Increases Production While Reducing Erosion. Vast areas of rangelands administered by the Bureau of Land Management are a problem because of runoff, erosion, and low forage productivity. Slow infiltration of snowmelt and rainfall into fine-textured soils is the main cause of the problem. Contour furrowing on rangelands can greatly increase production while drastically reducing erosion. This is a valuable new management practice for rangelands.

PROCESSING, STORAGE, DISTRIBUTION, FOOD SAFETY, AND CONSUMER SERVICES RESEARCH

Current activites: Research is conducted to improve the efficiency of processing storage, and distribution of food and agricultural products. The major emphasis is to maintain or improve agricultural product quality and reduce costs of marketing, processing, storage, and transportation through research and technology that would reduce losses from waste, spoilage and insect infestation, reduce energy requirements and pollution, optimize retention of nutrients and quality and insure product safety.

Research is conducted on problems of human health and safety. Studies develop means to insure that food and feed supplies and products are free from toxic or potentially dangerous residues, harmful chemicals, and microorganisms introduced from agricultural sources, or during processing operations. The research also includes studies of the means to control insect pests of man and his belongings; prevent transmission of animal diseases and parasites to man; reduce the hazards to human life resulting from pesticide residues, toxic molds, tobacco, and other causes; and develop technology for the detection and destruction of illicit growth of narcotic-producing plants.

Research is conducted on consumer services by studying family use of resources, by identifying budgeting problems of families, and by providing information on fabric performance and the use and care of clothing and household articles by consumers.

Selected examples of recent progress:

New System Developed for Sweet Corn Preservation. Research on a new system for processing sweet corn indicates that pollution (concentration of waste

in effluent) can be reduced by 80 percent, yields increased by 20 percent, and product quality improved. The system also provides the first practical method for field processing and, consequently, reduced waste handling. Success of the technique will depend, in part, on breeding corn with loosely held kernels.

New Sweetener Available from Citrus. ARS researchers have identified compounds in the citrus peel that, through simple chemical manipulation, are converted to substances having an intense, pleasant, long-lasting sweet-ness. Petitions for use have been filed with appropriate Federal Agencies by both U.S. and French industries. These compounds may provide alternatives to saccharin. The value of products containing non-nutritive sweeteners is estimated at \$1.5 billion annually.

New Detection Methods Developed for Identifying Adulterated Honey. These new methods are based on differences in the relative proportion of carbon-isotopes in corn and flowering plants. They provide regulatory agencies an important analytical tool to assure consumer quality and industry integrity, and help in maintaining a viable bee industry.

Human Wheat Intolerance May be Preventable. Celiac disease, an intolerance of humans to wheat in the diet, affects one in 2,000 in the U.S. The wheat protein, A gliaden, is thought to be the toxic factor. ARS scientists have identified the chromosome responsible for the protein, developed a wheat that lacks this chromosome and, in cooperation with state researchers, have produced sufficient wheat to bake bread for evaluation by NIH to establish the exclusivity of the protein.

Corn Compound Removes Heavy Metals from Waste-Waters. A starch xanthate from corn developed by ARS chemists offers a new way to recover expensive and toxic heavy metals dissolved in industrial waste-waters. Several companies now are supplying this material produced from starch for recovery evaluation of lead from battery and gasoline antiknock agent production; silver from photographic processing; mercury from chlorine and lye production; and many metals, especially cadmium, from plating or mining.

Improved Domestic Rubber Producing Plant. ARS scientists have chemically treated guayule, a desert shrub native to Texas and Mexico, causing the plant to produce over 3 times the rubber it normally yields. Such increase might lead to a commercially feasible, domestic natural rubber source to replace the 719,000 tons imported yearly at a cost of \$500 million.

Improved Means to Control Respirable Cotton Dust. ARS scientists have developed a machine to remove very small dust particles from the air in cotton mills and industrial plants. The machine is self-cleaning and handles large volumes of air at significantly lower costs than conventional electrostatic dust collectors. Tests show dust removal efficiencies in excess of 98 percent. The new technology could help cotton mills reduce cotton dust-related disease among mill workers and meet expected OSHA standards.

Kenaf--A New Resource for Pulp and Paper. ARS research has shown that kenaf is a feasible replacement for forest trees in making pulp for either newsprint or quality printing papers. Kenaf is capable of yielding 3-5

times as much fiber per acre each year as trees. This annually renewable resource may prove to be an important supplement to forest products.

Low Temperature Treatment of Grapefruit Eliminates Fruit Fly. ARS scientists have shown that a low temperature treatment of grapefruit maintains fruit quality and eliminates the Caribbean fruit fly. Grapefruit so treated might become acceptable on the Japanese market. This is an important alternative for controlling the Caribbean fruit fly because the presently used EDB ethylene dibromide fumigant may be banned in Japan.

Genetic Cattlehide Defect Correlates with Reproductive Failures.

Vertical Fiber Defect, an abnormal arrangement of cattlehide fibers occurs in 10 percent of 30 million Hereford hides yearly causing up to \$20 million loss of finished leather. ARS scientists found this defect is transmitted in certain lines of Hereford bulls. Calving records also show 30 percent rate of reproductive failures by cows with the defect compared with 10-14 percent by nondefective cows. ARS developed a novel biopsy method to identify carriers, permitting their elimination from commercial herds.

Protein Content of Wheat Now Measured Without Grinding. A near-infrared reflectance technique has been developed for measuring the protein content of wheat without grinding the sample. This makes possible a rapid instrumental analysis as wheat is delivered to the local elevator. Protein is an important quality factor in marketing grain. This instrument could be used as a basis for paying farmers for producing high protein wheat.

Improving Ground Beef. ARS research has determined that removal of the sinews and connective tissue from ground beef, improved the quality and acceptance of the product. The bulk of our ground beef is from old or grass-fed beef and desinewing should improve the quality and lower the retail price of ground beef.

Layouts Prepared for Poultry-Grading Work Stations. At the request of the Agricultural Marketing Service, grading station layouts were prepared for broiler and turkey processing plants. These layouts provided for better lighting and display of the carcasses being graded, thus increasing the accuracy and efficiency of poultry grading.

Study of Northeastern New Jersey Market Completed. Field work was completed for a Wholesale Distribution Center in Northeastern New Jersey and a preliminary report was made to the New Jersey Governor's Commission and to interested merchants. A new market center in this area would likely become one of the major distribution and terminal markets in the United States, as well as a major food export terminal.

Study Shows U.S. Grapefruit as Highest Quality in Europe. ARS researchers at Rotterdam, The Netherlands, have evaluated the quality of grapefruit marketed in Europe from all major producing areas around the world for a full marketing season. These studies included chemical, physiological and palatability factors and showed that grapefruit from Texas and Florida consistently were of higher internal quality than those from other countries. These data are very important to U.S. exporters. Similar studies are under way for lemons and oranges.

New Physical Insect Control Device Found for Dog Flies. A unique attractant-toxicant system has been discovered to control the dog fly (stable fly). The system utilizes a fiberglass panel treated with an insecticide. The fiberglass panel is naturally attractive to the dog fly which is killed by the insecticide when it alights on the treated panel. Dog fly control is obtained by placing the panels near fly-breeding areas and areas of animal concentration.

A Food Nutrient Suppresses Insect Infestation. A common mineral compound, substituted for calcium carbonate in enriched blended foods suppressed or prevented insect infestation. When this treatment was used in a one-year trial through the Food for Peace program, the amount of food lost because of insect damage was reduced significantly. Such a treatment would be important in many developing countries where adequate storage facilities and insect control procedures are not readily available.

ARS Scientists Markedly Improved Reliability of Aflatoxin Identification in Peanut Butter. The reliability of aflatoxin assay in peanut butter has been improved by the use of high performance liquid chromatography that can be conducted in one hour. This assay comes at a time when FDA has proposed to lower the tolerance level for aflatoxin, meets the critical need of the peanut butter industry, and could improve health protection to consumers.

New Energy-Saving Sprays for Mosquito Control. Use of ARS-developed ultra-low volume spray equipment to control adult mosquitoes in mosquito abatement districts throughout the United States has resulted in an estimated saving of 1/2 million barrels of fuel oil per year. Also, less insecticide is needed than the amount the older fogging machinery required to achieve the same result.

ARS Transportation Technology Improves Orange Shipments. Shipping experiments with California oranges in test cars in which ARS-developed "under-the-floor" air delivery systems were used indicated improved cooling, even with tightly stacked loads. Tightly stacked, high-density loads provide significant reductions in per-box transport costs and reduce energy requirements in transport and handling.

On-the-Farm Milk Processing Plants. ARS scientists developed a layout and improved methods for on-the-farm milk processing plants. These plants help local rural economies and provide sources of product for small retail outlets. Plants designed for on-farm processing could increase farm income by an estimated 26 percent.

HUMAN NUTRITION

Current Activities: Research is conducted on human nutritional requirements, composition and nutritive value of foods and food consumption surveys to provide dietary guidance and information needed by consumers and by Federal, State and local agencies administering food and nutrition programs.

Selected examples of recent progress:

Prediction of Fetal Malnutrition: ARS scientists have developed methods for identifying women at the 25th week of pregnancy who could be expected to give birth to malnourished babies. Early detection

could provide an opportunity to supplement the mother's diet. Worldwide, an estimated 15 million babies are affected each year.

Studies Show Yogurt Nutritionally Superior. ARS scientists studying the nutritional value of fermented milks, showed that yogurt is nutritionally superior to various other milk products. This is important information for determining diets and feeding requirements.

First Two Revised Sections of Agriculture Handbook No. 8 Published. This publication has long served as the primary reference base for nutritive values of foods. The collection, evaluation, and publication is being facilitated by the simultaneous development of a computerized system--the Nutrient Data Bank. Four revised sections are scheduled for release in FY-1978.

Modern Diets May be Deficient in Copper. ARS scientists have found that the copper content of modern human diets is substantially below levels judged advisable by the National Academy of Sciences. Also in metabolic studies researchers have gained new information on copper requirements for adults. These data will be useful to the Food Nutrition Board, National Academy of Sciences-National Research Council in making a recommended dietary allowance.

Status of Construction Projects as of December 1977

Status of research facilities authorized in prior years, and reported as uncompleted in the 1978 Explanatory Notes, is as follows:

NOTE: Design criteria provided by ARS to specify the program requirements and form the basis for negotiation of architect-engineer contracts. Diagrammatic drawings provide the basis for the first review of the architect's design. Tentative drawings are provided by the architect for firming up cost estimates and a basis for developing the completed, and final working drawings.)

<u>Location and Purpose</u>	<u>Funds Provided</u>	
	<u>Year</u>	<u>Amount</u>
<u>California, Albany</u> Wool utilization research	1968 Plans	\$ 50,000 <u>a/</u>
		Final working drawings completed May 1970.
<u>California, Riverside</u> Soil and water conservation research	1968 Plans	50,000 <u>a/</u>
		Final working drawings completed July 1970.
<u>Colorado, Akron</u> Soil and water conservation research	1970 Plans	50,000 <u>b/</u>
	1973 Construction ..	750,000
	1976 Redirection ..	<u>100,000 c/</u>
	Total	<u>900,000</u>
<u>District of Columbia; Washington</u> National Arboretum	1976 Land Acquisition and site preparation	5,985,000
		Construction was completed in the fourth quarter of fiscal year 1977.
<u>Indiana, West Lafayette</u> Soil and water laboratory	1978 Plans	400,000
		Criteria being prepared. AE contract expected to be awarded in third quarter of fiscal year 1978.
<u>Louisiana, Baton Rouge</u> Soil and water conservation research	1971 Plans	80,000
		Criteria being revised to meet new program requirements.

Status of Construction Projects as of December 1977 - Cont.

Location and Purpose

<u>Year</u>	<u>Funds Provided</u>	<u>Amount</u>
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Maryland, Beltsville
Sewage treatment facilities

1975	Construction ..	\$1,400,000 d/	Construction was completed for sewer and
1976	Construction ..	2,350,000	water lines in fourth quarter of fiscal
Total		3,750,000 e/	year 1977. Construction for East Waste Water
			Treatment plant expected to be completed in
			second quarter of fiscal year 1978. Con-
			struction for West Plant was completed in
			first quarter of fiscal year 1978.

Massachusetts, Boston
Adult human nutrition laboratory

1978	Plans	2,000,000
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Criteria being prepared. AE contract
expected to be awarded in second quarter of
fiscal year 1978.

Nebraska, Clay Center
Meat animal research (Phase II)

1968	Plans	250,000	Construction was completed in first quarter of
1975	Construction ..	5,020,000	fiscal year 1978.
1976	Construction ..	1,200,000	
Total		6,470,000	

New York, Ithaca
Soil and water conservation research

1968	Plans	40,000 a/	Due to cost escalation, funds for the Ithaca,
1976	Redirection ..	-40,000 f/	New York project have been redirected to
Total		--	Beckley, West Virginia to provide sufficient
			funds to construct the facility.

New York, Plum Island
Additional animal and laboratory
facilities

1973	Plans	250,000	Construction expected to be completed in first
1976	Construction ..	10,000,000	quarter of fiscal year 1979.
1977	Redirection ..	650,000 g/	
1977	Redirection ..	700,000 h/	
Total		11,600,000	

Status of Construction Projects as of December 1977 - Cont.

<u>Location and Purpose</u>	<u>Funds Provided</u>	
	<u>Year</u>	<u>Amount</u>
<u>New York, Plum Island</u> Air pollution abatement and sewage facilities		
	1973 Plans and construction ..	\$1,060,000 q/
	1976 Construction ..	2,600,000
	1977 Redirection ...	-550,000 q/
	Total	<u>3,110,000</u>
		Construction contract for incinerator modification in Building #101 incinerator B was awarded September 1976. Construction of incinerator B expected to be completed first quarter of fiscal year 1979. AE contract for incinerator A has been awarded and design was completed in the first quarter of fiscal year 1978.
<u>North Dakota, Grand Forks</u> Human nutrition research		
	1976 Plan	225,000
	1978 Construction ..	<u>3,500,000</u>
	Total	<u>3,725,000</u>
<u>North Dakota, Mandan</u> Greenhouse facility		
	1978 Construction ..	375,000 q/
<u>Oklahoma, El Reno</u> Feed mill replacement		
	1978 Construction ..	1,500,000 q/
	Total	
<u>Texas, Temple</u> Grassland and forages research		
	1968 Plans	150,000
	1971 Construction ..	1,500,000
	1973 Construction ..	<u>500,000</u>
	Total	<u>2,150,000</u>
		Construction was completed in third quarter of fiscal year 1977.

Status of Construction Projects as of December 1977 - Cont.

Location and Purpose

Funds Provided

<u>Year</u>	<u>Amount</u>
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West Virginia, Beckley
Soil and water conservation research

1972	Plans\$ 70,000
1973	Construction .. 700,000
1976	Redirection .. 40,000 £/
1978	Redirection .. 1,509,000 h/
Total	2,319,000

West Virginia, Kearneysville
Fruit Crop Research

1973	Plans 200,000
1976	Construction .. 7,570,000
1978	Redirection .. -2,209,000 h/
Total	5,561,000

Wisconsin, Madison
Dairy forage research center

1978	Plans 1,100,000
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Project being redesigned for a complete facility. Design expected to be completed in second quarter of fiscal year 1978 fiscal year consisting of two

Construction expected to be completed in fourth quarter of fiscal year 1978 fiscal year consisting of two

Criteria being prepared. AE contract expected to be awarded in third quarter of fiscal year 1978.

Footnotes:

- a/ Funds provided from the Contingency Research Fund.
- b/ Since \$50,000 appropriated in 1970 for planning a Soil-Water-Plant Research Laboratory, Ithaca, New York, and Soil and Water Laboratory, Akron, Colorado, was insufficient to plan both of these facilities, the full amount was used at Akron, Colorado.
- c/ Due to cost escalation, an additional \$100,000 has been reprogrammed from unspent balances of completed construction projects for construction of the Akron, Colorado, facility.
- d/ Planning funds were not appropriated separately, but are included in the funds appropriated for construction.
- e/ In addition, the Department of Treasury will provide \$100,000 toward costs incurred in completing the project.
- f/ Due to cost escalation, funds for the Ithaca, New York, project have been redirected to Beckley, West Virginia, to provide sufficient funds to construct the facility.
- g/ Due to the inclusion of some pollution abatement facilities in the animal and laboratory project, which would otherwise have been constructed separately, funds were redirected from the air pollution abatement and sewage treatment project to provide funds for the complete facility as originally planned and designed for the animal and laboratory project. In addition, \$100,000 has been redirected into the Plum Island animal and laboratory project from regular program funding.
- h/ Due to cost escalation and to provide funds for the complete facilities as originally planned and designed at the Beckley, West Virginia project and the Plum Island animal and laboratory project, funds were redirected from Kearneysville, West Virginia.

CONTINGENCY RESEARCH FUND

The Contingency Research Fund, established by Congress in fiscal year 1962, is designed to provide a ready source of funds to meet unforeseen and immediate research needs. Releases from the fund are generally made in situations where an emergency exists, or for special needs such as an unexpected scientific "break-through," or for new diseases or pest problems where it appears inadvisable to wait for consideration of a request for funds for the project in the regular budget process. In allocating funds, the procedure ordinarily is to make no commitments for allocations from the fund beyond the current year.

In fiscal year 1977, releases from the Contingency Research Fund were made for the following purposes:

1977 Obligations

Animal Production Efficiency Research:

Determine presence of bluetongue virus in reproductive organs of cattle	25,000
Development and evaluation of laboratory methods for the diagnosis of bovine brucellosis	87,500
Development of Swormlure-2 for screwworm population suppression and control on the island of Curacao, N.A.	50,000
Epizootiology, diagnosis and pathogenesis of pseudorabies of swine	60,000
Epizootiology of brucellosis: Evolution and taxonomy of <u>Brucella</u> organisms	60,000
Evaluation of pilus vaccines for prevention of scours due to enterotoxigenic <u>E. coli</u> in calves and pigs ...	26,100
Initiate studies on strains of pseudorabies virus, modes of transmission, and development of an attenuated marked vaccine	69,400
Studies of the cell mediated immune system of cattle in diagnosis and assessing immunity of brucellosis ..	20,000
Study progressive pneumonia virus (PPV) of the U.S. Sheep Experiment Station flock	25,000
Support of research on an acute respiratory disease in turkeys	20,000
Toxicological studies on introduced species scheduled for seeding on western ranges and pastures	14,000

Crop Production Efficiency Research:

Assessment of soil-plant water status and disease interactions for wheat under Pacific Northwest drought conditions	5,300
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Control of phony peach disease by early detection, chemotherapy and vector survey	30,000
Development of new control technology for citrus black fly	90,000
Elucidate and remedy the threat to U.S. bean industry posed by a virus recently discovered at Prosser, Washington to be seedborne in important commercial bean varieties and breeding lines	49,000
Identification of <u>Heliothis zea</u> sex pheromone	24,500
Intensified research to develop practical applications for Japanese beetle synthetic female sex pheromone ..	15,000
Quarantine fumigation of hay exports	5,000
Research on verticillium wilt in alfalfa and development of a resistant alfalfa variety	90,000
Selection of bean, pea, and potato varieties and cultural practices for more efficient use of soil moisture	12,000
Test U.S. sugarcane clones in Jamaica for smut reaction	75,000
Toxicological studies on introduced species scheduled for seeding on western ranges and pastures	6,500
<u>Research on Conservation and Use of Land and Water Resources and Maintaining Environmental Quality:</u>	
Assessment of soil-plant water status and disease interactions for wheat under Pacific Northwest drought conditions	5,200
Impact of severe drought on growth and survival of citrus trees	12,500
<u>Processing, Storage and Distribution Efficiency Research:</u>	
Quarantine fumigation of hay exports	5,500
<u>Research to Improve Human Health and Safety:</u>	
Evaluate safety and environmental effects of dimilin insecticide	35,000
Mosquito control using sterile male method	32,500
Toxicity studies on ammoniated aflatoxin contaminated corn in laying hens	50,000
Total, 1977 Obligations, Contingency Research Fund ..	<u>1,000,000</u>

Current Activities. As of December 1977, a total of \$178,000 has been approved for release from the Contingency Research Fund in FY 1978.

1978 Estimated
Obligations

Crop Production Efficiency Research:

Cucumovirus - Associated RNA: A new disease agent responsible for tomato necrosis	\$ 70,000
Emergency exploratory epiphytological and epidemiological studies of diseases related to mechanical harvesting in grapes and blueberries	18,000
Testing U.S. sugarcane clones in Jamaica for smut reaction	10,000

Research to Improve Human Health and Safety:

Influence of closed boll harvesting on reaction of human subjects to cotton dust	25,000
Survey for aflatoxin contamination in corn in the midwest	5,000

Research on Conservation and Use of Land and Water
Resources and Maintaining Environmental Quality:

"Acid Rain" and its effects on agricultural productivity	<u>50,000</u>
Total, 1978 approved for release from Contingency Research Fund	178,000
Balance to be allocated prior to September 30, 1978	<u>822,000</u>
Total available, 1978 Contingency Research Fund	<u>\$1,000,000</u>

STATEMENT OF OBLIGATIONS AND MAN-YEARS

BY LOCATION

Location	Actual 1977		Estimated 1978		Estimated 1979	
	Dollars	Man-Years	Dollars	Man-Years	Dollars	Man-Years
ALABAMA, Auburn	1,648,962	64	1,683,200	61	1,683,200	61
ALASKA, Palmer	516,642	9	500,900	9	500,900	9
ARIZONA						
Flagstaff	122,921	6	68,300	3	14,900	1
Mesa	114,201	4	—	—	—	—
Phoenix	3,024,214	117	3,167,200	111	3,167,200	111
Tucson	2,405,039	83	2,429,800	86	2,331,900	82
Total	5,666,375	210	5,665,300	200	5,514,000	194
ARKANSAS, Stuttgart	150,173	2	108,900	2	108,900	2
CALIFORNIA						
Albany	12,677,917	423	13,784,900	434	13,102,300	413
Brawley	777,965	31	809,200	30	809,200	30
Davis	619,321	14	765,700	19	638,400	15
Fresno	1,874,576	61	1,818,700	64	1,772,100	62
Indio	242,950	11	280,700	12	280,700	12
Pasadena	774,796	17	636,500	17	636,500	17
Riverside	1,984,876	62	1,844,400	57	1,768,100	54
Salinas	864,922	33	910,400	31	910,400	31
Shafter	585,231	20	646,000	20	445,700	14
Total	20,402,554	672	21,496,500	684	20,363,400	648
COLORADO						
Akron	292,776	9	273,400	9	273,400	9
Denver	1,210,293	41	1,240,400	42	1,240,400	42
Fort Collins	2,801,973	99	2,873,900	114	2,792,000	110
Total	4,305,042	149	4,387,700	165	4,305,800	161
DISTRICT OF COLUMBIA						
Program	1,784,952	85	1,696,700	84	1,696,700	84
Headquarters						
Agency Management Services	20,677,632	552	23,563,600	552	22,059,200	552
Centrally Financed Programs	2,038,991	5	11,493,800	73	33,590,500	318
Subtotal	22,716,623	557	35,057,400	625	55,649,700	870
Total	24,501,575	642	36,754,100	709	57,346,400	954
DELAWARE						
Georgetown	254,798	9	268,800	10	268,800	10
Newark	297,791	12	366,000	13	366,000	13
Total	552,589	21	634,800	23	634,800	23
FLORIDA						
Belle Glade	145,034	6	160,300	6	160,300	6
Bradenton	41,445	1	41,300	1	41,300	1
Brooksville	180,708	3	206,100	3	206,100	3
Canal Point	383,027	17	426,100	19	426,100	19
Fort Lauderdale	102,053	3	107,800	3	107,800	3
Gainesville	4,210,522	145	4,679,500	145	4,679,500	145
Lake Alfred	101,866	4	108,900	4	108,900	4

Reflects people affected by reduction before we knew where they were going - now reassigned.

STATEMENT OF OBLIGATIONS AND MAN-YEARS

BY LOCATION

Location	Actual 1977		Estimated 1978		Estimated 1979	
	Dollars	Man-Years	Dollars	Man-Years	Dollars	Man-Years
FLORIDA (continued)						
Miami	766,854	33	651,000	30	651,000	30
Orlando	1,915,607	79	2,173,600	79	2,126,500	78
Winter Haven	602,086	21	630,400	23	630,400	23
Total	8,449,202	312	9,185,000	313	9,137,900	312
GEORGIA						
Athens	5,977,404	243	6,329,600	250	6,474,600	247
Byron	1,405,241	61	1,381,600	57	1,381,600	57
Dawson	519,559	23	548,700	23	548,700	23
Experiment	229,215	7	248,200	6	248,200	6
Savannah	1,816,109	72	1,876,900	75	1,876,900	75
Tifton	2,886,816	105	3,261,500	108	3,121,400	103
Watkinsville	1,044,641	38	1,095,800	36	1,095,800	36
Total	13,878,985	549	14,742,300	555	14,747,200	547
HAWAII						
Hilo	281,248	10	368,300	12	368,300	12
Honolulu	913,193	29	1,029,900	35	1,029,900	35
Total	1,194,441	39	1,398,200	47	1,398,200	47
IDAHO						
Aberdeen	278,821	7	286,100	7	286,100	7
Boise	501,767	19	513,900	17	513,900	17
Dubois	756,649	19	754,500	19	754,500	19
Kimberly (Twin Falls)	1,299,621	50	1,315,400	49	1,315,400	49
Total	2,836,858	95	2,869,900	92	2,869,900	92
ILLINOIS						
Chicago	144,458	3	145,000	4	145,000	4
Peoria	12,967,754	471	13,653,100	475	11,588,300	398
Urbana	1,256,911	44	1,873,600	45	1,823,300	43
Total	14,369,123	518	15,671,700	524	13,556,600	445
INDIANA						
Lafayette	1,395,180	33	1,722,400	35	1,722,400	35
Vincennes	199,168	9	218,500	8	218,500	8
Total	1,594,348	42	1,940,900	43	1,940,900	43
IOWA						
Ames	8,535,930	310	10,068,200	313	10,068,200	313
Ankeny	337,611	10	349,100	10	349,100	10
Total	8,873,541	320	10,417,300	323	10,417,300	323
KANSAS, Manhattan	2,508,518	70	2,652,300	74	2,652,300	74
KENTUCKY, Lexington	651,048	28	765,100	27	158,700	1
LOUISIANA						
Baton Rouge	1,067,398	45	1,110,900	46	1,110,900	46
Crowley	59,423	2	112,100	4	112,100	4
Houma	764,522	29	771,700	31	771,700	31
Jeanerette	119,781	4	66,500	1	66,500	1

STATEMENT OF OBLIGATIONS AND MAN-YEARS

BY LOCATION

Location	Actual 1977		Estimated 1978		Estimated 1979	
	Dollars	Man-Years	Dollars	Man-Years	Dollars	Man-Years
LOUISIANA (continued)						
Lake Charles	200,085	7	222,700	7	222,700	7
New Orleans	13,795,322	480	14,270,100	486	13,339,200	463
Total	16,006,531	567	16,554,000	575	15,623,100	552
MAINE, Orono	473,874	17	464,300	17	464,300	17
MARYLAND						
Beltsville	48,409,323	1,663	48,894,400	1,696	45,811,900	1,597
Frederick	1,429,691	42	1,520,600	42	1,520,600	42
Glenn Dale	315,365	12	281,000	12	281,000	12
Hyattsville	2,055,177	86	5,700,000	93	5,700,000	93
Total	52,209,556	1,803	56,396,000	1,843	53,313,500	1,744
MICHIGAN, East Lansing	2,011,104	68	2,217,300	70	2,138,500	67
MINNESOTA						
East Grand Forks	321,414	9	302,300	10	302,300	10
Minneapolis	136,372	4	140,600	4	140,600	4
Morris	859,326	35	880,100	36	880,100	36
St. Paul	1,255,365	39	1,491,900	40	1,491,900	40
Total	2,572,477	87	2,814,900	90	2,814,900	90
MISSISSIPPI						
Gulfport	216,487	10	244,000	9	244,000	9
Meridian	309,662	12	313,100	13	313,100	13
Oxford	1,438,458	57	1,557,000	54	1,557,000	54
Poplarville	107,610	3	102,700	5	102,700	5
Mississippi State	3,334,338	111	3,304,600	97	3,222,800	95
Stoneville	4,192,994	177	4,552,800	179	4,434,200	173
Total	9,599,549	370	10,074,200	357	9,873,800	349
MISSOURI, Columbia	2,768,035	93	2,930,200	87	2,930,200	87
MONTANA						
Bozeman	522,033	18	556,300	17	512,500	16
Miles City	851,979	10	807,900	12	807,900	12
Sidney	673,662	27	730,300	29	730,300	29
Total	2,047,674	55	2,094,500	58	2,050,700	57
NEBRASKA						
Clay Center	4,843,446	56	5,062,700	55	5,062,700	55
Lincoln	1,057,805	31	1,132,500	31	1,132,500	31
Total	5,901,251	87	6,195,200	86	6,195,200	86
NEVADA, Reno	498,698	13	547,500	15	547,500	15
NEW JERSEY, New Brunswick ..	308,429	9	365,200	9	365,200	9
NEW MEXICO						
Albuquerque	174,145	6	—	—	—	—
Las Cruces	898,147	31	892,400	32	892,400	32
Total	1,072,292	37	892,400	32	892,400	32

STATEMENT OF OBLIGATIONS AND MAN-YEARS

BY LOCATION

Location	Actual 1977		Estimated 1978		Estimated 1979	
	Dollars	Man-Years	Dollars	Man-Years	Dollars	Man-Years
NEW YORK						
Geneva	143,269	6	155,800	5	155,800	5
Ithaca	1,802,859	41	1,921,900	43	1,750,600	39
Plum Island	9,050,418	350	9,107,400	340	9,107,400	340
Total	10,996,546	397	11,185,100	388	11,013,800	384
NORTH CAROLINA						
Oxford	1,018,272	37	952,000	33	--	--
Raleigh	2,332,395	55	2,757,300	73	2,697,400	71
Total	3,350,667	92	3,709,300	106	2,697,400	71
NORTH DAKOTA						
Fargo	3,968,634	120	4,035,300	123	3,884,900	118
Grand Forks	1,443,005	32	1,650,800	29	1,650,800	29
Mandan	1,465,157	54	1,501,300	50	1,501,300	50
Total	6,876,796	206	7,187,400	202	7,037,000	197
OHIO						
Columbus	143,273	3	167,900	5	167,900	5
Coshocton	450,433	17	487,600	17	487,600	17
Delaware	412,551	14	414,300	16	414,300	16
Wooster	926,325	37	991,300	37	880,800	32
Total	1,932,582	71	2,061,100	75	1,950,600	70
OKLAHOMA						
Chickasha	690,453	33	780,200	32	780,200	32
Durant	498,140	23	591,300	18	591,300	18
El Reno	367,262	8	602,000	7	602,000	7
Stillwater	731,907	21	863,700	21	863,700	21
Woodward	318,133	16	338,400	13	338,400	13
Total	2,605,895	101	3,175,600	91	3,175,600	91
OREGON						
Burns	75,892	2	80,300	2	--	--
Corvallis	1,181,511	43	1,922,300	45	1,853,200	43
Pendleton	570,270	18	576,500	19	576,500	19
Total	1,827,673	63	2,579,100	66	2,429,700	62
PENNSYLVANIA						
University Park	1,436,569	50	1,709,200	49	1,709,200	49
Wyndmoor	8,518,904	326	9,209,200	311	7,416,200	279
Total	9,955,473	376	10,918,400	360	9,125,400	328
SOUTH CAROLINA						
Charleston	817,584	38	827,700	35	827,700	35
Clemson	1,056,960	39	1,104,800	39	832,600	29
Florence	900,148	35	955,800	38	955,800	38
Total	2,774,692	112	2,888,300	112	2,616,100	102
SOUTH DAKOTA, Brookings-						
Madison	924,738	37	948,600	34	948,600	34

STATEMENT OF OBLIGATIONS AND MAN-YEARS

BY LOCATION

Location	Actual 1977		Estimated 1978		Estimated 1979	
	Dollars	Man-Years	Dollars	Man-Years	Dollars	Man-Year
TENNESSEE						
Greenville	128,808	4	141,700	6	--	--
Jackson	93,633	4	138,200	4	138,200	4
Knoxville	741,794	27	868,200	27	868,200	27
Lewisburg	91,077	4	100,800	4	100,800	4
Total	1,055,312	39	1,248,900	41	1,107,200	35
TEXAS						
Beaumont	361,148	13	393,500	15	393,500	15
Big Spring	151,008	5	161,700	5	161,700	5
Brownsville	1,098,585	53	1,228,900	46	1,228,900	46
Brownwood	311,677	12	430,300	12	430,300	12
Bushland	1,031,259	37	1,159,200	35	1,159,200	35
College Station	4,358,821	179	4,671,000	141	4,619,900	139
El Paso	50,801	2	50,500	2	--	--
Kerrville	1,406,620	58	1,663,600	47	1,603,800	45
Lubbock	672,225	25	726,700	25	726,700	25
Mission	716,495	22	669,500	16	669,500	16
Temple	1,476,335	41	1,528,800	42	1,528,800	42
Vernon (Chillicothe)	59,153	3	62,100	2	62,100	2
Weslaco	2,730,440	111	2,798,700	98	2,717,700	95
Total	14,424,567	561	15,544,500	486	15,302,100	477
UTAH, Logan	1,737,315	57	1,765,800	58	1,765,800	58
VIRGINIA						
Blacksburg	98,663	3	109,600	4	109,600	4
Richmond	131,083	5	151,100	5	--	--
Suffolk (Holland)	305,275	11	348,900	13	348,900	13
Total	535,021	19	609,600	22	458,500	17
WASHINGTON						
Prosser	1,041,322	38	1,051,800	38	914,600	32
Pullman	1,870,348	66	1,903,400	66	1,903,400	66
Wenatchee	616,320	22	670,600	22	670,600	22
Yakima	1,233,418	45	1,286,700	49	1,219,200	46
Total	4,761,408	171	4,912,500	175	4,707,800	166
WEST VIRGINIA						
Kearneysville	--	--	258,000	--	258,000	--
Morgantown	380,269	15	415,400	16	415,400	16
Total	380,269	15	673,400	16	673,400	16
WISCONSIN, Madison	1,405,706	44	1,591,800	42	1,591,800	42
WYOMING						
Cheyenne	393,506	15	467,500	15	--	--
Laramie	298,540	12	313,200	13	278,400	11
Total	692,046	27	780,700	28	278,400	11
PUERTO RICO						
Mayaguez	806,935	39	729,800	38	729,800	38
Rio Piedras	286,557	9	313,600	9	313,600	9
Total	1,093,492	48	1,043,400	47	1,043,400	47

STATEMENT OF OBLIGATIONS AND MAN-YEARS

BY LOCATION

Location	Actual 1977		Estimated 1978		Estimated 1979	
	Dollars	Man-Years	Dollars	Man-Years	Dollars	Man-Years
VIRGIN ISLANDS, St. Croix .	197,509	12	150,100	4	150,100	4
OTHER COUNTRIES						
Argentina	48,898	--	54,800	1	54,800	1
El Salvador	293,769	2	240,500	2	240,500	2
France, Paris	224,143	8	283,200	9	283,200	9
Italy, Rome	212,162	6	179,300	7	179,300	7
Japan	--	--	93,900	2	93,900	2
Kenya	140,381	2	103,900	2	103,900	2
Netherlands, Rotterdam ..	232,074	4	251,000	5	251,000	5
Pakistan	62,638	1	58,200	2	58,200	2
Thailand	73,893	2	108,800	2	108,800	2
Total	1,287,958	25	1,373,600	32	1,373,600	32
Construction of Facilities	450,000	--	8,975,000	--	--	--
Contingency Research Fund .	<u>a/</u>	--	1,000,000	--	1,000,000	--
Repair and Maintenance of Facilities and Equipment	<u>b/</u>	--	8,216,000	--	8,216,000	--
Unobligated Balance	5,144,355	--	--	--	--	--
Subtotal, Available or Estimate	281,979,466	9,421	324,958,000	9,475	323,208,000	9,285
Allotment to:						
Forest Service	929,534	16	380,000	4	380,000	4
Total, Available or Estimated	282,909,000	9,437	325,338,000	9,479	323,588,000	9,289

a/ Obligations for the \$1,000,000 appropriated in 1977 are included in the projects above.

b/ Obligations for the \$3,312,000 appropriated in 1977 are included in the projects above.

c/ Excludes \$15,000,000 appropriated in 1978 for Competitive Research Grants. It is included in the CSRS justification to reflect comparability with the 1979 Budget.

Scientific Activities Overseas (Special Foreign Currency Program)

Appropriation Act, 1978	\$5,750,000
Budget Estimate, 1979	7,500,000

PROJECT STATEMENT
(on basis of appropriation)

Project	1977 Actual	1978 Estimate	Increase or Decrease	1979 Estimate
1. Market development research, Sec. 104(b)(1)	\$1,000,000	\$ 800,000	\$ +200,000	\$1,000,000
2. Agricultural and forestry research, Sec. 104(b)(3)	5,700,000	4,450,000	+1,100,000	5,550,000
3. Translation and dissemina- tion of scientific publications, Sec. 104(b)(3)	800,000	500,000	+450,000	950,000
Total, appropriation	<u>7,500,000</u>	<u>5,750,000</u>	<u>+1,750,000</u>	<u>7,500,000</u>

The following statement reflects carryover into succeeding years of actual or estimated prior year balances and shows total actual or planned obligations.

PROJECT STATEMENT
(on basis of available funds)

Project	1977 Actual	1978 Estimate	Increase or Decrease	1979 Estimate
1. Market development research, Sec. 104(b)(1)	\$ 414,090	\$ 800,000	\$ +200,000	\$1,000,000
2. Agricultural and forestry research, Sec. 104(b)(3)	4,945,432	6,625,002	-1,075,002	5,550,000
3. Translation and dissemina- tion of scientific publications Sec. 104(b)(3)	885,108	985,000	-35,000	950,000
Total, obligations	<u>6,244,630</u>	<u>8,410,002</u>	<u>-910,002</u>	<u>7,500,000</u>
Unobligated balance, start of year	-1,404,632	-2,660,002	+2,660,002	. - -
Unobligated balance, end of year	<u>+2,660,002</u>	<u>- -</u>	<u>- -</u>	<u>- -</u>
Total, available or estimate	<u>7,500,000</u>	<u>5,750,000</u>	<u>+1,750,000</u>	<u>7,500,000</u>

EXPLANATION OF PROGRAM

Foreign currencies which the Treasury Department determines to be excess to the normal requirements of the United States are used for expenses of carrying out programs of the Department of Agriculture as authorized by law and described under sections 104(b) (1) and 104(b) (3) of the Agricultural Trade Development and Assistance Act of 1954, as amended. Research is carried on through agreements negotiated with research institutions and organizations in foreign countries. The research must be of importance to American agriculture. It serves to preserve and expand existing markets and develop new ones for agricultural commodities. It provides for research supplementary to domestic programs on problems of farm marketing, utilization, agricultural economics and human nutrition, and makes possible the conduct of research on exotic insect pests and diseases of plants and animals which could not be done in the United States. Specialized projects provide for the translation and dissemination of foreign language scientific publications.

JUSTIFICATION OF INCREASE

An increase of \$1,750,000 for special foreign currency research (\$5,750,000 available in 1978).

Objective: Expand research to benefit U.S. agriculture, increase markets for U.S. agricultural commodities, and assist foreign agricultural development.

Need for Increase: The program benefits U.S. agriculture and helps participating countries to further enhance their research capabilities without any adverse effect on U.S. balance of payments. The increase of \$1,750,000 proposed in FY 1979 would be used to finance research overseas through the purchase of excess foreign currencies. For FY 1979 excess currencies are expected to be available in five countries--Burma, Guinea, India, Pakistan, and the Arab Republic of Egypt. Based on surveys of the scientific capacity of foreign institutions and evaluation of research proposals submitted by these institutions, the total amount requested for FY 1979 can be effectively used to finance research of a mutual interest.

Anticipated obligations for FY 1978 based on available and negotiated research proposals total approximately \$8.1 million.

At present, there are approximately 122 approved research proposals which cannot be financed with FY 1978 funds, 60 additional proposals are being reviewed or being revised by Department scientists, and based on past experience an additional 80 proposals will be received during the course of FY 1978. Of those received in 1978, approximately 40 are expected to be approved for research. Leading into FY 1979, there should be over 222 approved proposals awaiting financing of which approximately 58 could be funded within the FY 1979 estimate of \$7,500,000. With the gradual depletion of excess foreign currency on deposit for U.S. uses, it is immediately important to be sure that a fair share of remaining currencies is dedicated to cooperative agricultural research and exchanges in agricultural science and technology which will benefit all countries concerned. The development of better ways to meet the ever-growing food and fiber needs was reemphasized in the recent National Academy of Sciences' World Food and Nutrition Study. SFC research is leaning more toward larger projects, which offer the advantages of integrated research and increase the opportunities for more immediate solutions to problems. Overseas research utilizing foreign currencies under sections 104(b) (1) and (3) of Public Law 480, as amended, supplements and complements research conducted in the United States under regular dollar appropriations. These foreign research projects do no duplicate or displace domestic research conducted by the Department or its cooperators. The projects are of mutual interest to the United States and the host countries.

Plan of Work: The \$1.75 million increase will be used for new grants to undertake studies aimed at solving high priority agricultural problems such as new and improved uses of cotton; improvement of market quality of exported farm products; improvement of transportation and storage methods; research on cereal grains, grain legumes and

oilseeds; research on pesticide residues; research on improved soil and water uses; and research to develop and apply alternative agricultural production systems in narcotic producing areas. Other important program priorities to be continued will be pollution; food safety; nutrition and health; livestock production, protection, and quality; environmental resources; timber production; plant protection; new and improved plant germplasm; and research to find parasites and predators to control crop pests of economic importance.

STATUS OF THE SPECIAL FOREIGN CURRENCY RESEARCH PROGRAM (SFCRP)

In fiscal year 1958, the Department initiated a research grant program abroad utilizing foreign currencies from the sale of surplus agricultural commodities under Title I of Public Law 480. Originally confined to market development research authorized by Section 104(b) (1) of P.L. 480, as amended, the program was subsequently expanded to include agricultural and forestry research under Section 104(b) (3) of the law, as amended. In fiscal year 1966 the authorization was changed to permit the use of all excess currencies for work performed under the Special Foreign Currency Program. Activities sponsored fall into the following general areas:

1. Agricultural research, including research on plant and animal production; use and improvement of soil, water and air; and research on marketing, use and effects of agricultural products.
2. Forestry research, including research on the protection of forests from fires, diseases and insects; on methods and procedures for increasing the growth of managed forests, and on properties and uses of forest products.
3. Agricultural economics research, including farm and market economics research and foreign trade analysis.

Dollar-financed research in these areas is conducted by the Agricultural Research Service, the Forest Service, and the Economic Research Service in their respective areas of functional and subject-matter responsibilities. Research under this program is designed to complement and not to duplicate or displace the dollar-financed research activities of these agencies.

Within the Department, primary responsibility for administration of this program is assigned to the Agricultural Research Service. The activities are coordinated with operations in the Forest Service, Economic Research Service, APHIS, and the Foreign Agricultural Service by the Director, International Programs Division, ARS. The Director coordinates development of broad policies for operations of the program and coordinates the activities of the various Department agencies in carrying out research financed by foreign currencies. Initial arrangements and budget clearances for the research in foreign countries are made through the Department of State as required by Executive Order 10900, Section 3(b) and (c), and through the Agricultural Attaches of the Foreign Agricultural Service of the Department. Prior to executing any research agreement with a foreign institution, the Department again consults with the Agricultural Attaches and Heads of Missions to ensure that the proposed projects would be consonant with the foreign policy of the United States.

Care is exercised to make certain that research projects supported by special foreign currency benefit American agriculture and consumers. Careful attention is given to the type of institution conducting research under this program to make certain it has the facilities, equipment, and personnel to carry out sound and productive research. Because of these high standards during the life of the program, about 58 percent of the proposals received from foreign institutions

have been rejected by the Department; 41 percent of the proposals have been accepted, and the agreements have been executed or are awaiting execution. Final determination has not yet been made on acceptance or rejection of the remaining 1 percent.

U.S. research priorities, as well as foreign country participant priorities, are constantly updated and publicized through personal contacts and written communications. Consequently, the bulk of the proposals currently submitted for consideration are generally of the highest interest to U.S. agriculture.

Selected Examples of Recent Progress: In fiscal year 1977, 41 new agreements were obligated with foreign research institutions. Agreements vary in total amount for the life of the project from approximately \$12,000 to slightly over \$475,000 dollar equivalent. Examples of recent research programs under these agreements follow:

Potential Disease-Resistant Millet Being Developed. U.S. agriculture is in constant danger from the accidental introduction of foreign animal and plant diseases. A SFC project in India identified sources of disease-resistant millet germplasm, which were sent to the United States and are being incorporated into U.S. varieties. Since pearl millet is a very important forage crop in the U.S., results of this research can represent a substantial savings to U.S. farmers.

Decay in Fruits Controlled During Prolonged Storage: Studies in Poland demonstrated that certain fungicides used as preharvest sprays increased the resistance of fruits to fungal rot during storage under controlled atmospheric conditions. As a result such preharvest sprays are being used in the United States for prolonged storage of strawberries and peaches.

Biological Control Found for Russian Thistle: A tiny moth imported from Pakistan is helping to control Russian thistle (tumbleweeds) and halogeton, a weed toxic to some livestock. The moth attacks only these two weeds and is the natural enemy of the weeds in Asia and parts of Africa. Russian thistle has invaded most parts of the country, particularly the western states and parts of the central states. Halogeton has taken over nearly 10 million acres of western rangelands.

Effects of Environmental Pollution Determined on Some Forest Insects: Scientists in Poland found that forest stands polluted by industrial sulfur dioxide and particulate fallout show an increase in several groups of plant-eating insects. Seven aphid species showed dramatic correlations with increased pollution by sulfur compounds. Also, certain beneficial insects were found to be resistant to pollutants, which is important to U.S. researchers contemplating beneficial insect introductions.

Relationship of Calcium Intake to Degenerative Bone Diseases Determined. Studies in Yugoslavia showed that high calcium intake by young adults provides increases in bone mass and fewer fractures in middle aged and elderly people. This is important information to the U.S. in the revision of the Recommended Dietary Allowances.

New Information on Aflatoxins from India: Very important findings from this project on the common fungal contaminants that produce aflatoxins are:

New procedures for isolation and purification of individual compounds comprising the aflatoxin group;

Development of synthetic growth medium;

Information on metabolic formation of aflatoxin;

Determination that low available zinc in soybeans may limit aflatoxin production in soybeans; and

Development of a single-step procedure to recover aflatoxin in pure form.

Thirty-three major scientific publications have been produced from this project.

SPECIAL FOREIGN CURRENCY PROGRAM
 RESEARCH PROPOSALS AND AGREEMENTS BY SUBJECT MATTER
 (Cumulative: Through September 30, 1977)

				Total Number of Agreements Currently Active	
				Total Number of Agreements Obligated	
				Number of Proposals	
Received	Rejected	Awaiting Modification Negotiation or Review	Approved (Proposals) Awaiting Obligation	Number	Dollar Equivalent
4,016	2,340	47	160	1,469	\$ 99,614,538
509	252	8	21	228	15,513,644
165	112	5	4	44	2,633,246
1	-	-	-	1	146,381
3	2	-	-	1	32,073
TOTALS	4,694	2,706	60	185	\$117,939,882
				1,743	353
					\$ 35,759,323

Obligations, Expenditures and Conversions of Foreign Currencies

Obligations: Through September 30, 1977, a total of \$126,531,651 (including \$5,311,600 for administrative expenses) has been obligated for activities under the Special Foreign Currency Program. In fiscal year 1978, an additional \$8,410,002 will be used. These obligations are summarized as follows:

Cumulative Obligations through F.Y. 1978
(Dollars in Thousands)

Fiscal Year	Market Development Research (Sec. 104(b)(1))		Agricultural and Forestry Research (Sec. 104(b)(3))		Translations of Publications and Scientific Cooperation, Executive Office of the President a/		Total
	\$	371.5	\$	371.5	\$	1.7	
1958	•••••	•••••	•••••	•••••	•••••	•••••	\$ 371.5
1959	•••••	•••••	•••••	•••••	•••••	•••••	1,653.5
1960	•••••	•••••	•••••	2,230.5	•••••	793.2	3,023.7
1961	•••••	•••••	•••••	1,893.2	•••••	1,565.2	5,290.8
1962	•••••	•••••	•••••	2,859.0	•••••	595.8	8,749.4
1963	•••••	•••••	•••••	2,566.3	•••••	248.6	7,815.6
1964	•••••	•••••	•••••	3,214.8	•••••	555.5	8,236.7
1965	•••••	•••••	•••••	3,485.8	•••••	72.2	8,966.1
1966	•••••	•••••	•••••	703.7	•••••	-199.5	4,381.6
1967	•••••	•••••	•••••	1,620.6	•••••	114.5	9,688.3
1968	•••••	•••••	•••••	991.9	•••••	-44.1	7,264.8
1969	•••••	•••••	•••••	971.9	•••••	-	5,705.1
1970	•••••	•••••	•••••	790.5	•••••	-	4,866.5
1971	•••••	•••••	•••••	654.0	•••••	-	4,825.8
1972	•••••	•••••	•••••	840.4	•••••	-	6,694.0
1973	•••••	•••••	•••••	1,026.1	•••••	-	9,021.9
1974	•••••	•••••	•••••	195.9	•••••	-	7,747.4
1975	•••••	•••••	•••••	349.2	•••••	-	6,612.8
1976 b/	•••••	•••••	•••••	326.6	•••••	-	9,371.3
1977	•••••	•••••	•••••	414.1	•••••	-	6,244.6
1978 (Est'd.)	•••••	•••••	•••••	800.0	•••••	-	8,410.0
Total	•••••	•••••	•••••	\$27,957.8	•••••	\$3,703.1	\$134,941.4
				\$103,280.5	•••••		

a/ This fund merged with Special Foreign Currency Program by the Department of Agriculture and Related Agencies Appropriation Act, 1969. b/ Includes Transitional Quarter.

The following tables present a more detailed picture of the \$6,244.6 obligated in 1977 and the \$8,410.0 estimated to be obligated in 1978 for the Special Foreign Currency Program.

Special Foreign Currency Program Fiscal Year 1977 Obligations
(In Thousands)

Market Development Research
Section 104 (b) (1)

Agricultural Research
Section 104 (b) (3)

Country	Agricultural and Forestry Research			Animal and Plant Health Inspection Service	Total
	Agri- cultural Research	Agri- cultural Economics Research	Forestry Research		
Burma	\$ - -	\$ - -	\$ - -	\$ - -	\$ - -
Colombia	- -	- -	- -	- -	- -
Egypt	333.2	- -	- -	- -	333.2
Germany	- 1.1	- -	- -	- -	- 1.1
Guinea	- -	1	- -	- -	1
India	38.3	537.0	22.5	- -	597.8
Israel	- 2.7	- 23.8	- 1.4	- 1.9	- 29.8
Italy	- 3.4	- -	11.4	11.5	19.5
Morocco	- -	- -	- 4.5	- -	- 4.5
Pakistan	163.6	1,477.0	159.9	351.7	2,162.2
Poland	-103.9	804.8	- -	243.1	944.0
Sri Lanka	- -	5.1	.8	.9	6.8
Sweden	- -	- -	- -	- -	- -
Switzerland	- -	.1	- -	- -	.1
Tunisia	- -	- -	121.5	24.1	145.6
Turkey	- -	- -	- .3	- -	- .3
United Kingdom	- -	.1	- -	- -	- .1
Yugoslavia	- 9.6	- 3.8	- .1	- .9	- 14.4
Total	\$ 414.1	\$4,125.2	\$ 181.7	\$ 628.5	\$ 10.0 \$5,359.5

Transfer to National Science Foundation for translation of scientific publications
..... 885.1

GRAND TOTAL
..... \$6,244.6

Special Foreign Currency Program - Estimated FY 1978 Obligations
 (In Thousands)

Market Development Research
Section 104(b)(1)

Agricultural and Forestry Research
Section 104(b)(3)

<u>Country</u>	<u>Agricultural Research</u>	<u>Agri-cultural Research</u>	<u>Agri-cultural Economics Research</u>	<u>Forestry Research</u>	<u>Total</u>
Burma	-\$	\$ 100.0	\$ -	\$ 100.0	\$ 100.0
Egypt	\$ 200.0	1,747.0	127.5	649.2	2,723.7
Guinea	-\$	100.0	-\$	-\$	100.0
India	400.0	1,379.4	52.5	141.7	1,973.6
Italy	-\$	4.0	-\$	-\$	4.0
Pakistan	200.0	1,966.7	160.0	197.0	2,523.7
Total.....	\$ 800.0	\$ 5,297.1	\$340.0	\$987.9	\$7,425.0
Transfer to National Science Foundation for translation to scientific publications				985.0	
GRAND TOTAL					<u>\$8,410.0</u>

Expenditures: Expenditures of foreign currencies, from the inception of the program through September 30, 1977, totaled \$108,195.491. In addition, the Department plans to expend \$6.750,000 in fiscal year 1978. These expenditures may be summarized as follows:

Cumulative Expenditures through F.Y. 1978
(In Thousands)

<u>Fiscal Year</u>	<u>Market Development Research</u>	<u>Agricultural and Forestry Research</u>	<u>Executive Office of the President a/</u>	<u>Total</u>
1959	\$ 195.1	\$ - -	\$ 0.1	\$ 195.2
1960	654.6	- -	75.1	729.7
1961	1,254.9	350.2	495.2	2,100.3
1962	1,735.8	1,351.8	425.6	3,513.2
1963	2,136.8	2,071.7	590.9	4,799.4
1964	2,292.9	2,514.9	655.5	5,463.3
1965	2,816.3	3,724.6	616.0	7,156.9
1966	2,435.2	4,113.9	211.2	6,760.3
1967	2,487.0	4,754.6	224.7	7,466.3
1968	1,951.0	5,028.8	200.5	7,180.3
1969	1,598.9	5,454.6	- -	7,053.5
1970	1,092.6	4,863.4	- -	5,956.0
1971	955.9	4,753.1	- -	5,709.0
1972	884.2	5,337.3	- -	6,221.5
1973	704.1	4,644.0	- -	5,348.1
1974	731.2	7,052.9	- -	7,784.1
1975	783.6	6,491.7	- -	7,275.3
1976 b/	902.9	9,477.8	- -	10,380.7
1977	403.5	6,699.0	- -	7,102.5
1978 (est'd.)	449.0	6,301.0	- -	6,750.0
Total	\$26,465.5	\$84,985.3	\$3,494.8	\$114,945.6

Cumulative Expenditures through F.Y. 1978
(In Thousands)

Conversions: As of September 30, 1977, the Department has converted a total of \$4,833,448 of foreign currencies as follows:

<u>Fiscal Year</u>	<u>(Dollars in Thousands)</u>
1961	\$ 770.0
1962	1,432.0
1963	1,910.1
1964	721.3
Total	<u>\$ 4,833.4</u>

a/ This fund merged with Special Foreign Currency Program by the Department of Agriculture and Related Agencies Appropriation Act, 1969, are included in the preceding table.

b/ Includes Transitional Quarter.

Passenger Motor Vehicles

The 1979 Budget Estimate does not include any purchase of additional passenger motor vehicles. A total of 95 vehicles will be replaced.

The passenger motor vehicles of this Agency are used by research scientists and staff personnel in the course of their daily work. These vehicles are operated chiefly at field stations engaged in research. These vehicles are used in travel where common carriers are seldom feasible. This involves travel to individual farms, ranches, commercial firms, cooperating experiment stations, etc. The vehicles are essential for collecting experimental data and materials necessary for facilitating research work.

It is the policy of ARS to pool the use of motor vehicles to keep the number of vehicles to a minimum and reduce overall costs for maintenance.

Replacement of passenger motor vehicles. Replacement would be made of 95 of the 472 (including 8 buses) passenger motor vehicles operated at field stations engaged in research. It is estimated that all of the 95 passenger vehicles to be replaced will have mileage of more than 60,000 or be 7 or more years old.

Age and Mileage Data for passenger-carrying vehicles on hand as of September 30, 1977:

<u>Age-Year Model</u>	<u>Number of Vehicles*</u>	<u>Percent of Total</u>	<u>Lifetime Mileage</u> (thousands)	<u>Number of Vehicles*</u>	<u>Percent of Total</u>
1972	194	41	80-100	21	4
1973	89	19	60-80	85	18
1974	69	15	40-60	164	35
1975	27	6	20-40	128	27
1976	44	9	Under 20	74	16
1977	49	10	---	---	---
TOTAL	472	100		472	100

* Includes 6 vehicles used in foreign countries, and 8 buses.

Aircraft

There will be no additions or replacements made of any of the six aircraft owned by this Agency. These aircraft are located at College Station, Texas, and Yakima, Washington. They are used in control methods, application of agricultural materials, infrared and color photography and evaluating efficiency affects on weather conditions.



